All you want to know about the BBC MICRO!

THE MICRO USER

Volume 2
Number 3
May 1984
£1

Win three of Pace's powerful new Grapevine modems, together with Commstar – your own passport to the exciting new world of computer communications.

Spreadsheets made simple: two ROM based programs reviewed

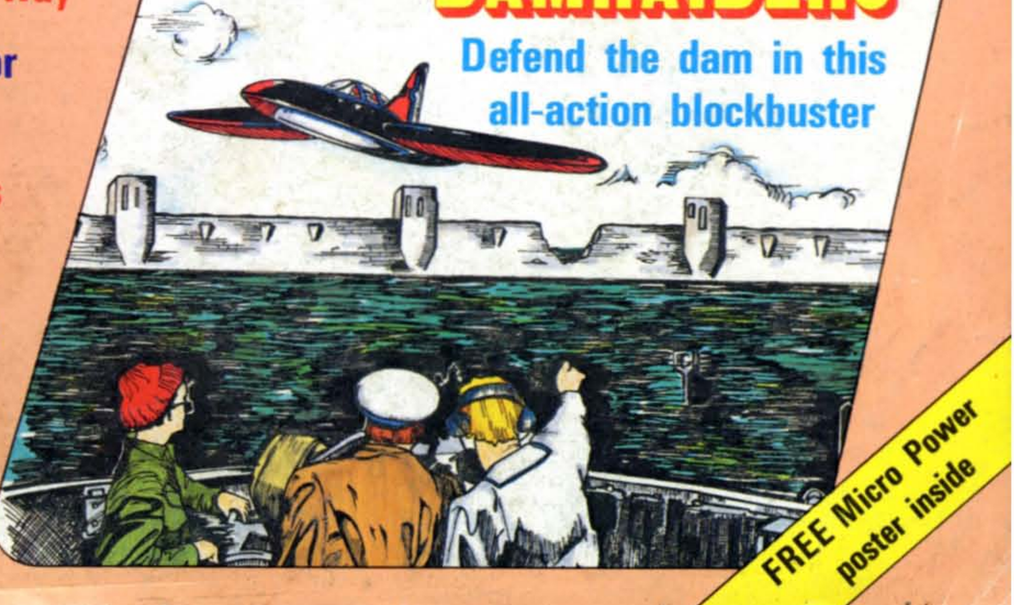
Multiply your graphic windows, with spectacular results!

Explore ENVELOPEs – the hands-on way

Larger letters for little ones

Stepping motors – step by step

PLUS lots more games, utilities and techniques

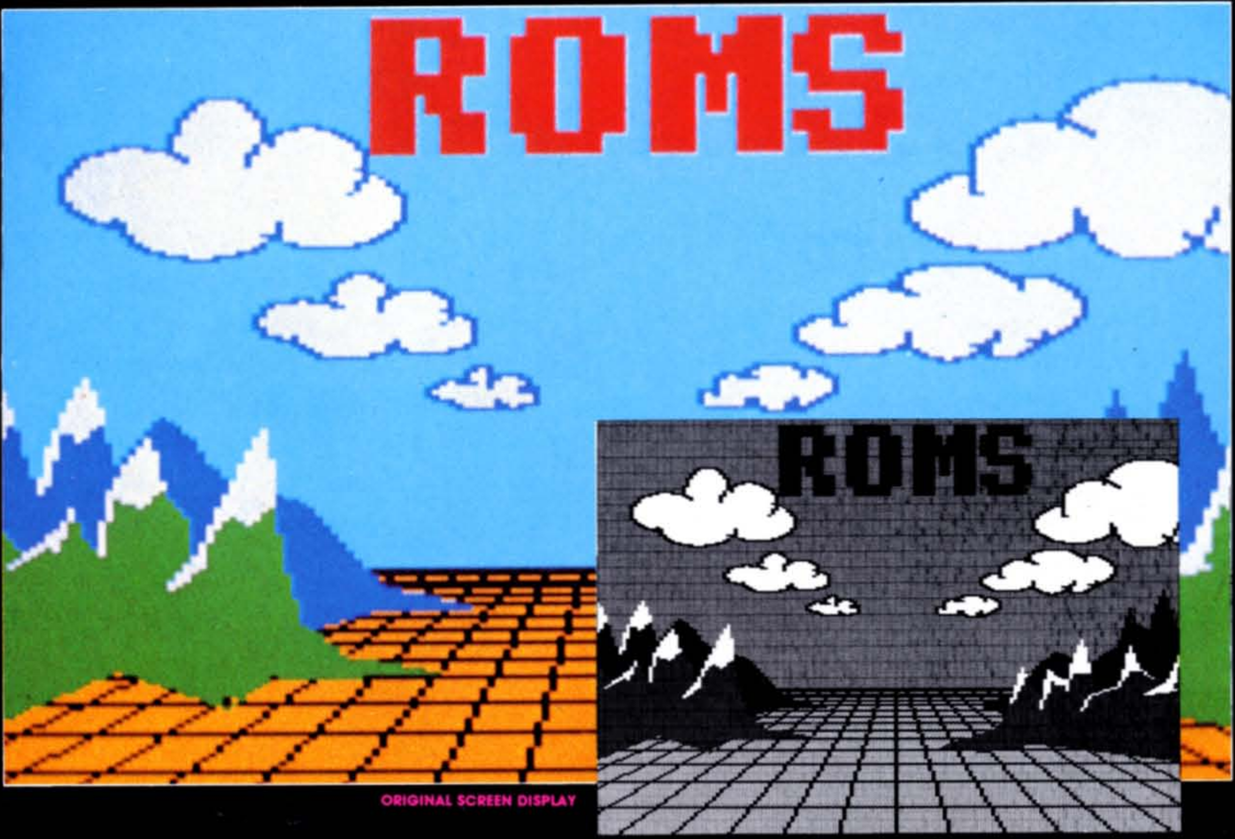


DAMRAIDERS

Defend the dam in this all-action blockbuster

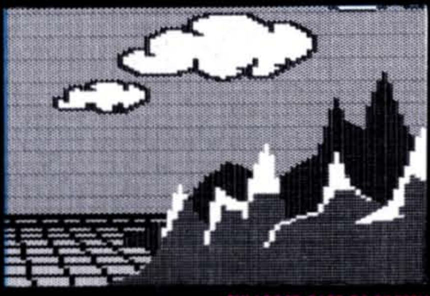
FREE Micro Power poster inside

For the BBC Micro

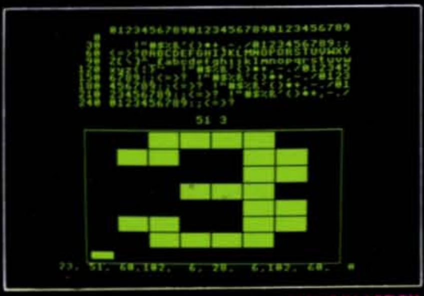


ORIGINAL SCREEN DISPLAY

WHOLE SCREEN DUMP



ENLARGED PART OF SCREEN



★DEFINE IN ACTION

Printmaster

Joining our already extensive range comes PRINTMASTER a sophisticated printer handling utility ROM. PRINTMASTER will be released in several versions catering for each of the most popular printers on the market. This first PRINTMASTER ROM supports a range of EPSON printers: MX80, RX80, FX80 and other compatible printers.
All commands in the ROM must be preceded by an asterisk and can be used like all normal operating system commands from within BASIC programs etc. It is also possible to use them from WORDWISE and other language ROMs.

PRINTMASTER supports three types of screen dumps. The most flexible (★GDUMP) allows any graphics on the screen to be dumped onto the printer. This will operate in any mode, the colours being displayed as shades. Any part of the screen may be printed at any position on the paper in any one of four orientations. It is also possible to magnify the screen dump by any factor x2, x3, x4 etc.

A special feature allows true Mode 7 screen dumps with TELETEXT text and graphics, colours (as shades), double height etc.

★TDUMP allows any text mode to be dumped and ★FDUMP will automatically print the contents of a file on disc to the printer WHILE the BBC machine is doing other things, running other programs etc.

★DEFINE allows the redefinition of any user definable character in the simplest possible manner. See screen photo opposite. ★USAVE and ★ULOAD can be used to save or load all user definable characters.

★WINDOW allows the user to interactively define a graphics window, this controls the part of the screen printed in ★GDUMP this is a very much easier method of defining graphics windows than the normal VDU statement.

The above list is only a fraction of the commands in the PRINTMASTER ROM. Others include ★CENTRE, ★UNDERLINE, ★ITALIC, ★MARGIN etc. etc. which provide total control over the printer. Order as PRINTMASTER (Epson).

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Educational programs are different. You're looking for quality and lasting appeal—which is what Sulis Software programs are all about.

Then there's the problem of level. Age is no guide to ability or knowledge, and a program which is too easy or too difficult isn't much use. Shop assistants aren't always knowledgeable, and magazines are full of games. People know it's important to choose the right programs—but how do you go about it?

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For 10 years people have been using our products to improve their language skills. Writers, journalists, linguists, teachers and designers have worked with us to create materials which help people to learn—and to find pleasure in learning.

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"I would like to compliment Sulis Software on their achievement in producing English teaching programs which are both enjoyable and usefully informative.

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All you want to know about the BBC MICRO!
THE MICRO USER
SPIRO

Vol. 2 No. 3 May 1984

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The Micro User welcomes program listings and articles for publication. Material should be typed or computer-printed, and preferably double-spaced. Program listings should be accompanied by cassette tape or disc. Please enclose a stamped, self-addressed envelope, otherwise the return of material cannot be guaranteed. Contributions accepted for publication will be on an all-rights basis.

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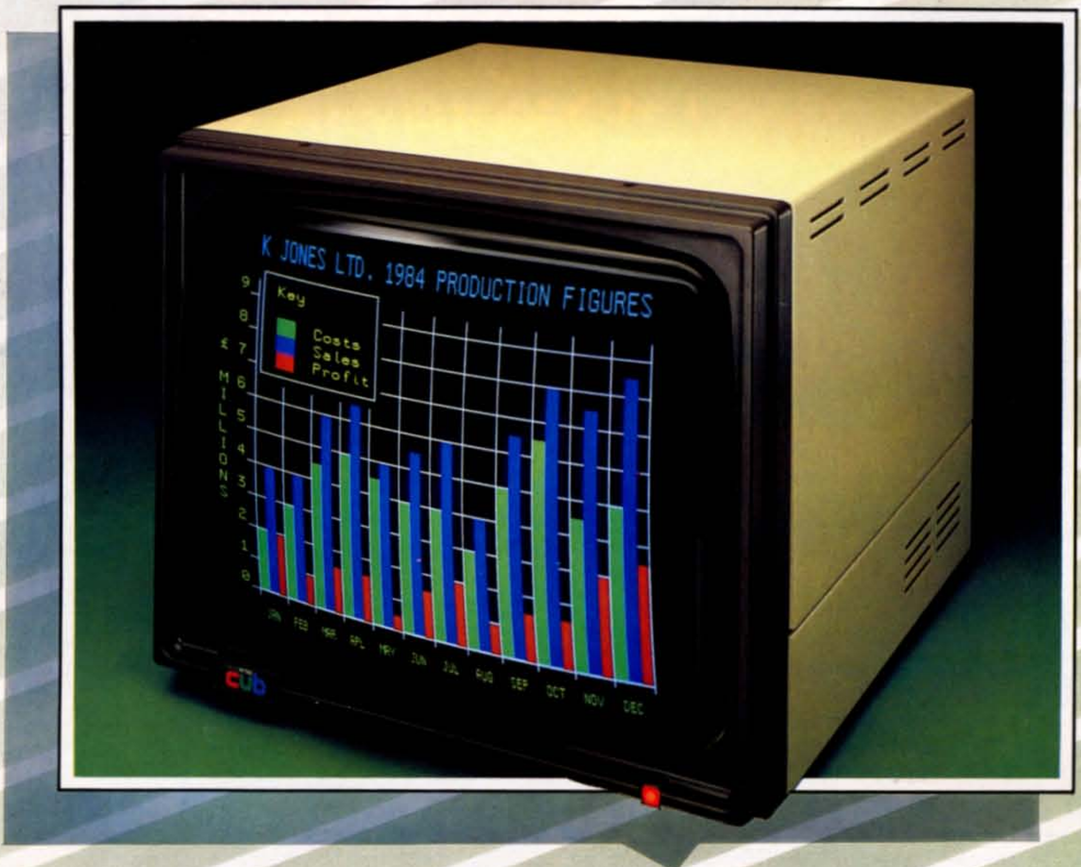
SERIOUS DECISIONS NEED THE SUPPORT OF OUR 80 COLUMNS



Most serious users of micro computers require the facility to display in 80 columns, especially for word processing. Try this on most monitors and the result will be a frustratingly fuzzy image.

The Microvitec CUB 653 gives the user not only glowing colour, but also pin-sharp-images, thanks to a medium resolution screen 653 pixels wide by 585 high, plus a selective transmission panel giving super-high contrast. These features make this model from the CUB range of monitors the perfect partner for the high resolutions generated by BBC B, SINCLAIR Q.L., I.B.M., ELECTRON, ORIC, APPLE II and IIe, and many others.

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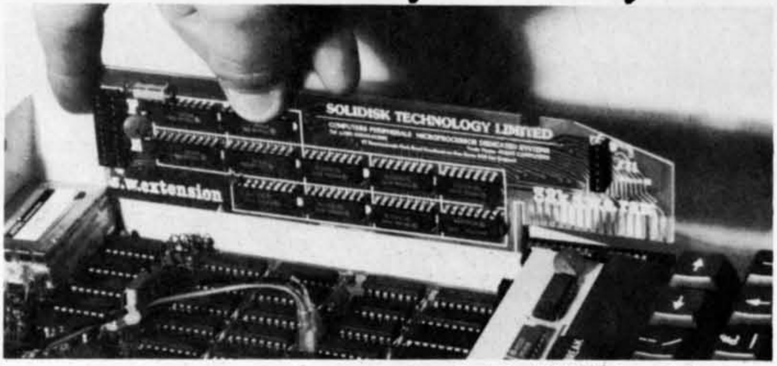
The BBC-Sideways RAM System



The BBC Sideways RAM:
The most exciting add-on for the BBC micro, which many have been waiting for Acorn to produce!

What is the Sideways RAM?
The sideways RAM is a 16K (upgradable to 128K) memory board which fits into the rightmost ROM socket on your BBC micro. The sideways RAM is an essential piece of hardware for any BBC computer. Strategically integrated into the BBC system, the system CAN:

Answer definitively to shortage of Sideways ROM sockets:
The Sideways RAM is capable of running sideways system software such as languages, wordprocessor, electronic spreadsheet, etc.

Increase free memory for languages, add more entries to disk:
The sideways RAM can also be used to increase available memory by moving disk workspace into sideways RAM. PAGE is then set to the lowest possible value i.e. &0E00 thus rendering tape based software fully compatible with Acorn's disks. Furthermore, the disk directory is given extra space so that the maximum number of entries is increased from 31 to 154. Clearly, there is no way that other disk filing systems can offer such performance.

Increase text space for wordprocessor:
The Sideways RAM can also be used to increase effectively WORDWISE's text capacity from 24K to 32K or to a full 64K with the Silicon Disk. With the Sideways RAM system, you can create a whole chapter of a book in a single file! Machine code programmers using the Sideways RAM facilities are exceptionally favoured: the system can create assembly modules of up to 64K in size, up to 24K of space for labels and variables. A typical 8K machine code can be assembled in 2 minutes by BASIC, even directly to Sideways RAM.

Add a silicon disk to your computer:
If you have 128K of sideways RAM, part of it (112K) can be turned into a silicon disk. If you have a single drive, the system will address your floppy disk as drive 0 and the silicon disk as drive 1 (or 4 if you have 2 or more) but with a difference! The silicon drive has the capacity to load a 24K program faster than you can remove your finger from the 'RETURN' key with no clicking noise, no on/off LED, no wear. It can make you a backup floppy in 15 seconds from the original, proofread your wordprocessor texts nearly as fast as your own speed or re-create a relocatable, documented source code from an 8K ROM in minutes. The sheer speed of sideways RAM is absolutely ideal for programs like BEEBUG'S MASTERFILE (database applications), SPELLING CHECKER, VIEW (word-processing), Computer Concepts GRAPHIC EXTENSION (LOGO, Sprites etc.), BASIC, PASCAL, BCPL etc. Many other applications including games like ADVENTURE or CHESS will benefit from the ability of the Sideways RAM to make colourful 3D-graphic look like a movie picture or retireve any record in milliseconds. With the Solidisk fitted, the BBC outperforms most 16 bit machines.

Free software with every sideways RAM system:
The Sideways RAM comes already with lots of free software (on a 40 track single sided diskette). Sideways system software is free to all STL users, now and for future additions. All programs are given in basic source code and you are encouraged to personalise. Benevolent contributors will be rewarded with free hardware gifts. For example: 'STL0E00' and 'STL154' to set PAGE=&0E00 and allow 154 possible filenames, 'STLDISC' to create and maintain the SILICON DISK with extra commands like *FORMAT, *VERIFY and *DCOPY, 'WORD32' and 'WORD64' to increase text size for WORDWISE to 32K or 64K characters, STLASM to produce very large (up to 100K) assembly programs and a few other demonstration programs. Soon to be released: STLBASIC to run basic programs right in the Silicon Disk.

Increase the computer power by increasing sideways RAM:
The power of the BBC relies on its intelligent use of software where several sideways ROMs execute different tasks such as filing, calculating, drawing, processing, playing music, talking, compiling, debugging etc. The bigger the sideways RAM, the bigger the task the computer can handle.

Beautifully designed, easily installed, no soldering required:
The sideways RAM was first introduced and the first issue sold out at the ACORN USER SHOW (Sept. 83, London). The new issue has been exhibited at the PCW SHOW (Oct/Nov. 83, London), was on general distribution release at the BBC USER SHOW (Dec. 83, Westminster, London), reviewed by all major BBC micro magazines and user clubs and since then every week, hundreds of BBC users discover the convenience of the Sideways RAM system.
You can install it in 2 minutes and do not need to solder.
You can buy the 128K Solidisk now or a 16 or 32K Sideways RAM and upgrade it later if you needs grow.
Further upgrading is very simple: from 16K to 32K is by straight exchange (cost: £15 + p&p), from 32K to 128K is by plugging in the SOLIDISK extension (see figure 3) onto the 32K sideways RAM. It costs just £85 plus p&p.
You can also take advantage of the cheap hardware add-ons such as EPROM PROGRAMMER (£15) and EPROM ERASER (19.95) designed specially to compliment the sideways system.

Soon Available: Solidisk's Floppy Disc Systems:
STL also produce DISK PACKS which comprise all the necessary IC's, DFS ROM, manual, connecting cables, demonstration diskette in different storage capacities ranging from the basic 100K disc system to 1.8MB dual drive system.
Both single density and double density are supported, fully compatible with ACORN disk system and the sideways RAM system. The choice of single or dual density is yours and there is virtually no difference in price.
SINGLE DENSITY DISK SYSTEM: based on the Intel 8271, the single density disk interface consists of a set of IC's to be added directly to the BBC board and is comparable to Acorn's disk interface upgrade. You choose 1 or 2 drives (up to 4 drives are supported), they are all half height units and usually come from TANDON, SHUTGUART, TEAC or CANNON with capacity ranging from 100K to 400K per drive (switchable). The single density disc system uses normal FM/IBM compatible recording technique, soft sectored 5¼"diskettes commonly available. Discs formatted with this system has 10 sectors of 256 bytes per track (2.5K bytes), a 40 track drive will offer 100K of storage using this system, a 80 track drive will offer 200K bytes and a double sided 80 track drive 400K, only 2 of the later can be used on the BBC. The real advantage of the single density disc system is neatness: the disc chip set goes neatly on the BBC board.
DUAL DENSITY DISK SYSTEM: based on the NEC 765A, the dual density disk system offers both single density and double density using MFM recording technique. The disc interface comprises a set of IC's and a small module plugging into socket 78. The advantage of the dual density disc system is the nearly twofold increased storage capacity with the same disc drive.
For price information, please refer to ordering coupon below.

Detachable Keyboard Case and Integral Computer/Disk Case:
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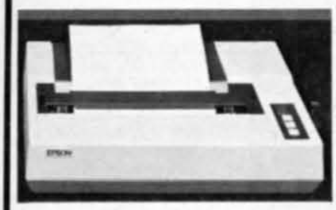

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NOW AVAILABLE – The TORCH Z80 SECOND PROCESSOR CARD – for those who already have suitable disc drives. The card is supplied with all the free software, as detailed above, presenting a very attractive package. **£375.**

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TORCH Z80 SYSTEM

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GRAPHICS Plotter	£270.00a

COLOUR/GREEN MONITORS (leads incld)

Microvitec 1431 14" RGB Std Res	£195.00a
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(All include cables, manual + format disc)

100K (40 Track)	£140.00a
100K (40 Track) with psu	£165.00a
200K (40/80 Track)	£175.00a
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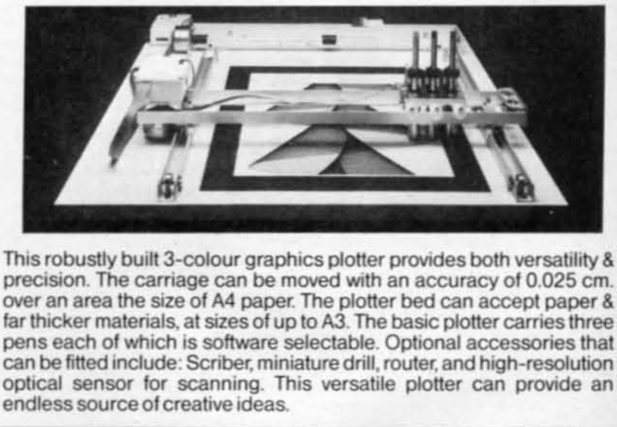
400K (80 TDS) with psu	£225.00a
2x100K (40 Track) with psu	£320.00a
2x200K (40/80 Track) with psu	£400.00a
2x400K (80 Track DS) with psu	£420.00a
3" Hitachi 100K Drive	£160b
Accessories:	
40/80 Track Switching Module	£30.00c

ALL PRICES EXCLUDE VAT. Please add carriage 50p

COLOUR GRAPHICS PLOTTER:



This robustly built 3-colour graphics plotter provides both versatility & precision. The carriage can be moved with an accuracy of 0.025 cm. over an area the size of A4 paper. The plotter bed can accept paper & far thicker materials, at sizes of up to A3. The basic plotter carries three pens each of which is software selectable. Optional accessories that can be fitted include: Scriber, miniature drill, router, and high-resolution optical sensor for scanning. This versatile plotter can provide an endless source of creative ideas.

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Plus friendly service and professional advice

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80T SS/DD	£24.00	£26.00c
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SOFTWARE:		
ACORN/MERLE BUSINESS SOFTWARE		
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This long awaited range brings professional business software to the small business user at a budget price. Available on disc only, using genuine 'random access', each package can, if required, be linked together to provide a totally integrated business system. Modules comprise Invoicing, Order Processing, Stock Control, Accounts Receivable, Accounts Payable, Purchasing, Mailing System. Each package **£22.65**(d).

ACORN IEEE INTERFACE

A full implementation of the IEEE488 standard, providing computer control of compatible scientific & technical equipment, at a lower price than other systems. Typical applications are in experimental work in academic and industrial laboratories. Phone for details. **£282.**

DISC DRIVES:

A full range of disc drives fitted with quality Japanese slimline mechanisms, (such as TEAC, MITSUBISHI etc.) are supplied ready to connect to your BBC, and come complete with necessary cables, formatting disc, manual etc. TEAC & MITSUBISHI mechanisms can operate in single and double density modes. The switchable disc drives give the user flexibility, by allowing access to both 40 & 80 Track discs. The 40/80 Track switching module can be simply attached to your standard 80 track drives thereby vastly increasing their versatility. We have a full range of diskettes, variety of disc storage cases, disc-drive cables. The **Floppiclene** head cleaning kit, is the ideal way to ensure optimum performance of your drives. The use of disposable cleaning discs eliminate the risk of recontamination and abrasion, and ensure continuous data capture and transmission.

TELETEXT

Converts your BBC into a fully fledged Teletext Terminal. In addition to normal reception of Teletext pages, it is able to 'download' software as well as saving standard pages on any of the four TV channels. **£196.**

ULTRACALC

With advanced features, such as: *Handling of labels as well as numbers, as values, allowing the search of a list by a meaningful name, instead of just a number. *Efficient memory usage allowing large spreadsheets to be constructed. *Variable width columns. Facilities include SUM, Replicate & most mathematical functions. It helps you to create and manipulate *Budgets *Cash-Flow forecasts *Price Lists *Balance Sheets *Time Sheets *Order Entry *Small Databases *Scientific Calculations etc. **£65.**

MICROTEXT

Developed by the National Physical Laboratory, is a programming system designed to simplify the production of a wide range of man-computer dialogues. Using MICROTEXT, an expert in any field can construct their own complete courses of computer-based instructional material. Applications include interviewing systems, teaching packages, training courses and interactive demonstrations and simulation. Cassette **£43.35**(c) Disc **£52**(c).

Continued on page 11 →

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DISC DRIVES FOR THE BBC MICRO

CHASE DATA LTD

UNIQUE FACILILTY: Only **CHASE DATA** utilise the two colour LED on the Canon 221 disc drive to show track mode selected and ready status:

40 track mode	**: LED Green**
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Power on	**: Half-illumination (red or green)**
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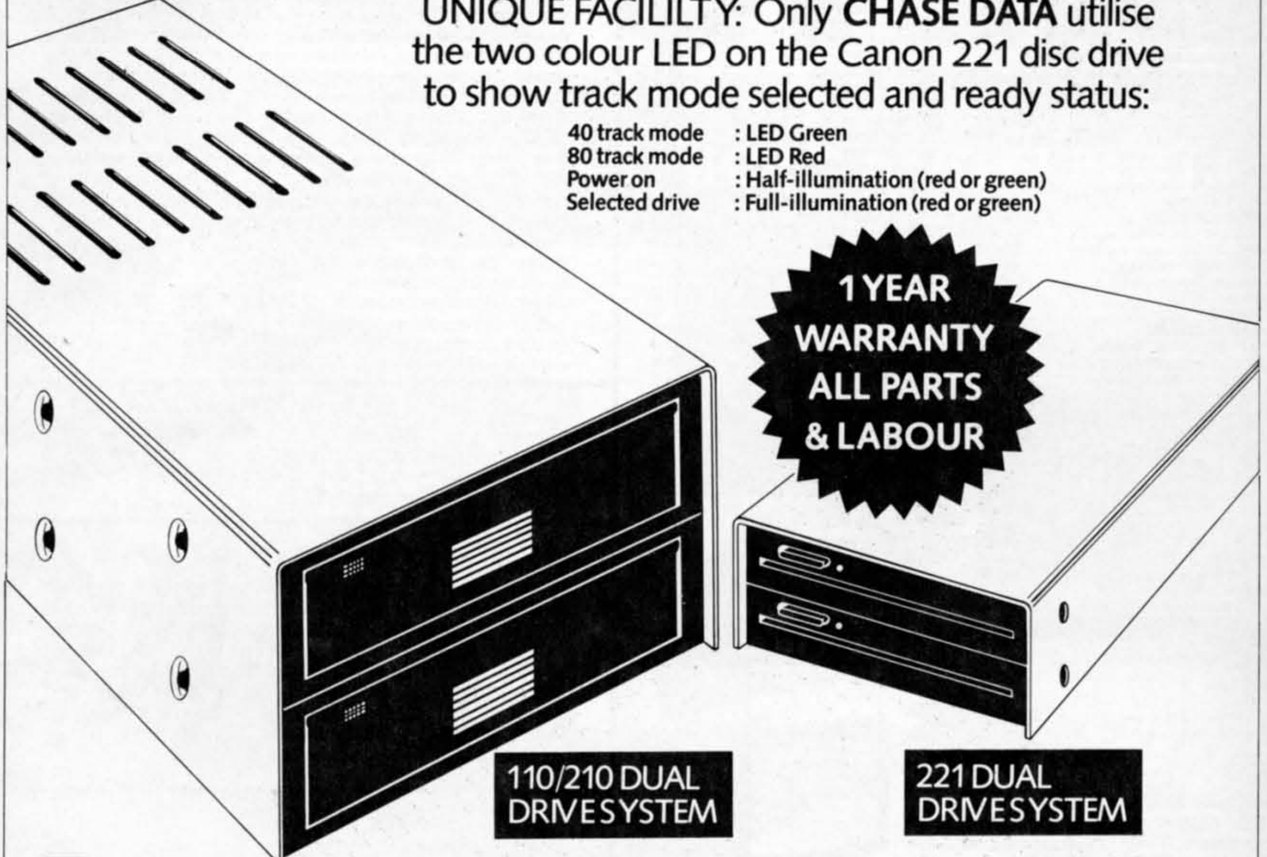

CHASE DATA LTD are pleased to annouce the launch of the latest generation of Canon disc drives – the ultra slim **model 221 (double sided 80 track) – TRULY SUPERB VALUE FOR MONEY**

All inclusive means
Disc drive + case + all power and data cables + U.K. carriage + utilities disc & manual + V.A.T.

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The Model 221 is available with its own **custom-built secondary switching power supply**. Safe, low in heat generation and outstanding value at £25 (inc. VAT)

Full service support
Our units come with a full 1 year warranty on parts & labour. Disc drive service is via the leading U.K. Independent Drive Service Company.

EPROMS 2764-250 nS £5.75p each.

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P.O. Box 6, Woking, Surrey GU21 4PB. ☎ (Tel: 0784 38487).

All inclusive price list

MODEL	110	210	221
FORMATTED CAPACITY OF SINGLE DRIVE ON BBC MICRO	100K	200K	400K
SINGLE DRIVE IN CABINET	£170	£198	£236
DUAL DRIVE IN CABINET	£320	£370	£437

All units available with on-board power supply. Additional cost: **£25**.

TECHNOMATIC

BBC Computer & Econet Referral Centre
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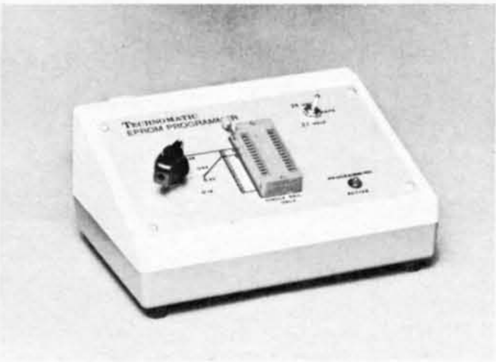
EPROM PROGRAMMER:

A fully self-contained mains-powered eprom programmer housed in an attractive finished case. It is able to program 2716, 2732/32A, 2764 & 27128's in a single pass. It is supplied with vastly superior software when compared to any currently available similar programmer. In addition to normal eprom programming, you are now able to load your favourite basic programs onto eprom.



The programmer comes complete with cables, software & operating manual.
£89 + £2.50 carriage. Software on disc £2 extra.

- **Menu Driven Software provides user friendly options for programming the eprom with:**
  - **a) Basic programs.**
  - **b) Ram resident programs.**
  - **c) Any other program.**
- **Programmer can read, blank-check, program & verify at any address/addresses on the Eprom.**
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- **Programming voltage selector switch.**
- **Full Editor with ASCII Disassembler, allowing direct modification of memory data in HEX or ASCII.**
- **Continuous display of time left for completion of programming.**
- **Continuous display of current addresses as they are being programmed.**

EPROM ERASERS

UV1T Eraser with built-in timer and mains indicator. Built-in safety interlock to avoid accidental exposure to the harmful UV rays. It can handle up to 5 eproms at a time with an average erasing time of about 20 mins. **£59 + £2 p&p.**
UV1 as above but without the timer. **£47 + £2 p&p.**

SPECIAL OFFER EPSON FX 80 PRINTER ONLY £325

including BBC printer lead
Twelve Months full warranty.
Offer valid while stocks last.

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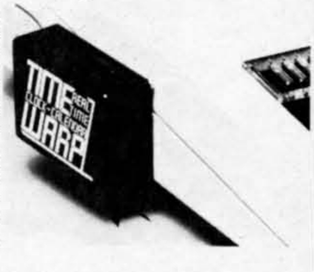
A low cost unit that opens up the total range of Real-Time applications. With its full battery backup, possibilities include an Electronic Diary, continuous display of 'on-screen' time and date information automatic document dating, precise timing & control in scientific applications, recreational use in games etc—its uses are endless and are simply limited by one's imagination. Simply plugs into the user port—no specialist installation required—No ROMS. Supplied with extensive applications software.
Please phone for details.
£29.00 + £2.50 carriage.



SMARTMOUTH:

**The original 'infinite speech'.
Still the best.**
A ready built totally self contained speech synthesiser unit, attractively packaged with built-in speaker, AUX output socket etc.—no installation problems! It allows the creation of any English word, with both ease and simplicity, while, at the same time being very economical in memory usage. You can easily add speech to most existing programs. Due to its remarkable infinite vocabulary, its uses spread throughout the whole spectrum of computer applications—these include industrial, commercial, educational, scientific, recreational etc. No specialist installation—no need to open your computer, simply plugs into the user port—and due to the simple software, no ROMS are needed. SMARTMOUTH is supplied with demo and development programs on cassette, and full software instructions. **£37+ £2.50 carriage.**

smart-mouth
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*Uses ATARI Style 9 pin joysticks
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BEEBUGSOFT

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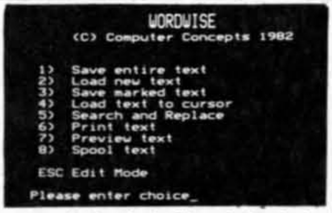
ROMS

SOFTWARE FOR THE BBC MICRO



```
                 WORDWISE
       (C) Computer Concepts 1982

  1)  Save entire text
  2)  Load new text
  3)  Save marked text
  4)  Load text to cursor
  5)  Search and Replace
  6)  Print text
  7)  Preview text
  8)  Spool text

  ESC Edit Mode

Please enter choice_
```

WORDWISE

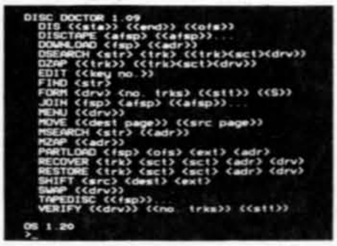
This ROM based word processor is simple to fit and simple to operate. Its greatest strength lies in its ease of use, yet it is a fully fledged text processing system, with all the features you would expect to find in many more expensive programs.

Once entered the user has total control over the text. Any section may be marked, this may be a word, sentence or any larger piece of text. The marked section may then be instantly deleted, moved or copied to any other point in the document. The more complex operations are menu driven so that the user is always prompted when necessary. When printing a document the user may specify the line length, line spacing, page length etc. WORDWISE even handles automatic page numbering, centering of text, justification and many more powerful features.

This word processor has become the best selling program for the BBC machine. In the year since its launch it has outsold all other available ROM, cassette or disc based word processors and continues to outsell them.

£46 incl. VAT and p&p.

DISC DOCTOR



```
DISC DOCTOR 1.09
   DIS ((sta)) ((end)) ((ofs))
   DISCTAPE <afsp> ((afsp))...
   DOWNLOAD <fsp> ((adr))
   DSEARCH <str> <trk> ((trk><sct><drv))
   DZAP ((trk)) ((trk><sct><drv))
   EDIT ((key no.))
   FIND <str>
   FORM <drv> <no. trks> ((stt)) ((S))
   JOIN <fsp> <afsp> ((afsp))...
   MENU ((drv))
   MOVE ((dest page)) ((src page))
   MSEARCH <str> ((adr))
   MZAP ((adr))
   PARTLOAD <fsp> <ofs> <ext> <adr>
   RECOVER <trk> <sct> <sct> <adr> <drv>
   RESTORE <trk> <sct> <sct> <adr> <drv>
   SHIFT <src> <dest> <ext>
   SWAP ((drv))
   TAPEDISC ((fsp))...
   VERIFY ((drv)) ((no. trks)) ((stt))

OS 1.20
>_
```

Following on from WORDWISE this utility ROM is the ideal way to get the most out of your computer system. This ROM adds 20 new commands to the Machine Operating System. Most of these are concerned with DISC operation although some of the commands are totally general purpose. Disc Doctor allows up to 60 files per side of a disc and includes its own disc formatting and verifying commands. Three search commands will find any string in memory or on disc, or will list all the line numbers in a BASIC program that contain the string. Many other features include disassemblers, disc/memory editors, function key listing etc. Works with all versions of the Acorn DFS, and other Acorn compatible DFS's.

£33.35 incl. VAT and p&p.

GRAPHICS ROM

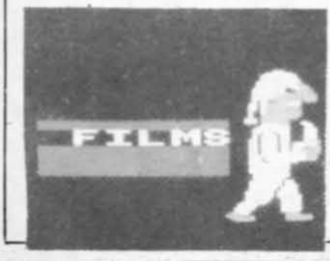
Our latest utility ROM includes over 28 new graphics related commands. These can be typed in like any normal commands and can of course, be included in BASIC programs. The commands are split into 3 distinct areas:-

1. Sprite graphics
These are multi-coloured shapes up to 24 x 24 pixels in size.
Once a sprite has been designed (using in-built routine) it can be plotted at any position on the screen and easily moved around. A sprite can also be part of a 'film' — a sequence of frames allowing animation up to 32 sprites or 'films' can be active on the screen at any time. A 'film' can contain up to 47 frames, each frame being any sprite image.

2. LOGO 'turtle' graphics
By using simple FORWARD, BACKWARD, LEFT and RIGHT commands a 'turtle' can be moved very quickly around the screen, producing intricate patterns by the most user-friendly means. Including these commands in structured BBC BASIC programs provides a system faster and more powerful than many of the packages currently used to demonstrate the LOGO language.

3. The third section consists of a large number of general purpose commands, such as:-
★ FILL which will fill ANY area on screen.
Fast circle and arc drawing
3D graphics routines allowing X, Y, Z co-ordinate plotting
Large character printing in a range of patterns
Scaling — allowing any part of the screen to be expanded or diminished
A rotate command that will rotate all plotting by any angle around the origin
Because this is a ROM, all the commands are instantly available. It has a built-in help menu showing the syntax of all commands. Supplied with a comprehensive manual and step-by-step fitting instructions, suitable even for the inexperienced. This ROM represents extremely good value for money.

£33.35 incl. VAT and p&p.



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EPSON
FX80

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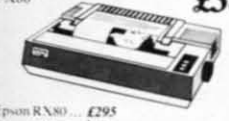

Epson RX80 ... *£295*
Epson FX100 ... *£489*

FX-80 is even faster. An astonishing 160 characters per second, proportional spacing, quick forms tear-off, superscripts, subscripts, dot addressable graphics and down loadable character set. Standard Centronics parallel compatible interface with optional RS-232C/current loop and IEEE interfaces. The FX-80 is pin fed and friction fed and can feed single sheets (optional tractor feed).

STAR GEMINI & DELTA

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£375

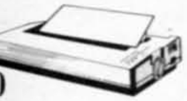
120 CPS (Gemini), 160 CPS + 8K buffer (Delta). Friction, tractor and roll feed. Ultra high resolution graphics. Normal, expanded and condensed print. Emphasized and double strike print. Superscripts and subscripts. True underlining. Italics and international characters. Downloadable character set. Interface — Gemini (parallel), Delta (parallel & RS232). Full one year parts and labour warranty.

SHINWA CP80

£230

80 column, friction and adjustable tractor feed, bi-directional logic seeking HI-RES graphics and block graphics sub and super scripts, condensed and emphasised print, and underlining vertical and horizontal tabs, self test, italic print, etc.

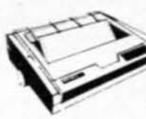
RITEMAN MATRIX PRINTER



£230

80 column, friction and pin feed, 120 CPS Bi-Directional, Hi-Res and block graphics, 9 x 9 matrix true descenders, normal, expanded, condensed printing, emphasised and double strike printing, italics printing, auto underlining, subscript and superscripts, international character sets, easy access dipswitches, 1:1 High Res (true circles and squares), optional tractor unit, optional RS232C interface.

MANNESMANN MT80



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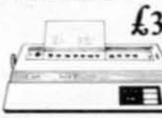
High quality 80 column serial dot matrix printer. Dual density dot addressable graphics, quick tear facility as standard. Ability to handle both tractor-fed fanfold and single paper.

DAISYWHEELS

JUKI 6100

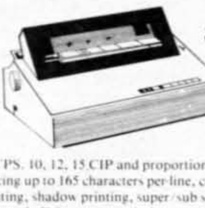
£395



20 CPS max (13 CPS Shannon text) 10, 12, 16 CPI and proportional spacing up to 220 characters per line, diablo protocols. Bold, shadow printing and underlining.

BROTHER HR15

£395



13 CPS, 10, 12, 15 CIP and proportional spacing up to 165 characters per-line, colour printing, shadow printing, super/sub script, auto underlining, text reprinting.
3K Buffer Standard.

Keyboard	£160
Sheet Feeder	£228
Tractor Unit	£109

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CANON PJ1080A

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7-Colour Drop on Demand Ink Jet. 40 CPS, Bi-directional Printing. High-resolution Graphics. Extremely quiet, less than 50dB. Ideal for Overhead Projection. Long-life Ink Cartridges. 3.5 Million Characters per Colour. Very compact & lightweight. 8-Bit Parallel Int — Epson compatible. Easily replaced. Accepts single sheets. International character sets.

WIRE DOT PRINTER

CANNON P.W. 1080A

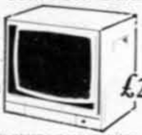
£299

80 column 160 CPS, near letter quality printing at 27 CPS. Will do italics or proportional spacing. Super and subscript down loadable character set, high resolution graphics, standard with friction and tractor. Optional RS232 available, fully compatible with Epsom control codes.

MONITORS

ALL MONITORS COME WITH FREE CONNECTING CABLES

NOVEX 14" MONITOR



£228

Low-cost model for personal computers. 14" Screen colour display. R.G.B. and composite inputs. Switch to allow monitor to be used as green screen monitor. Switch mode auto-regulated power supply. Professionally-styled Metal-Cabinet in B.B.C. Micro colours.

TV/MONITOR

£269

14" TV/MONITOR

This TV Monitor is not a modified television as many TV Monitors are, but a 14" TV/Monitor which has been designed to perform both functions. It has RGB and Composits video and sound. An RGB cable for a BBC is supplied as standard.

With Remote Control

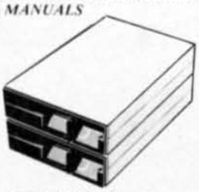
MICROVITEC 14" Colour Monitors

Microvitec 1431 14 Std. Res	£245
Med. Res	£395
Hi-Res	£495

DISK DRIVES

TEAC DISK DRIVES

INCLUDES FREE CABLES, FORMATTING DISK & MANUALS



TEAC 55A S/S 40 TRACK	
100K Single	£165
200K Dual	£330
TEAC 55E S/S 80 TRACK	
200K Single	£199
400K Dual	£398
TEAC 55F D/S 80 TRACK	
400K Single	£255
800K Dual	£510
Power Supply Unit (Optional)	£29
40/80 Switch	£8

MISCELLANEOUS

BBC MICROCOMPUTER

Model B	£399.00
Model B & Disk Interface	£469.00
Model B & Econet	£446.00
Model B & Econet & Disk Interface	£516.00
Teletext Receiver	£225.00
Official BBC Data Recorder	£ 29.95
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Basic 11	£ 32.00
Disk Interface Kit	£ 97.00

ECONET ACCESSORIES

Econet Ipterface	£ 70.00
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Terminator Box (Inc. PSU)	£ 35.00
Printer Server Rom	£ 49.00
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File Server Level 2	£249.00
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100M Econet Cable	£ 99.00
Econet System User Guide	£ 10.00

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Double your sideway Rom sockets, with the TCL Rom expander.
Simple to install and very easy to use!
Manufactured using components of the highest quality!

Extremely reliable!	£18.95
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View Word Processor	£59
Word Wise Processor	£39
UTILITY SOFTWARE	
Screen Dump Rom	£17.25

For EPSON, SHINWA, NEC, STAR

NEW TCL MICROGUIDES
The KEYPLATES to make it easy!

Microguide KEYPLATES fit neatly over your computer keys. Gives you an easy to read list of commands. Alphabetically arranged for immediate access. Placed exactly where you require it as part of your computer keyboard. The Keyplates, made of durable plastic, have space for function key notes. Clean-wipe pen for function key identity is supplied. + FREE ERROR MESSAGE BOOK. ALL FOR ONLY £5.95

WORD PROCESSING PACKAGE

Star bargain

£1,329

BBC Model B plus Disc/Interface fitted view, V.D.U. Green Monitor. Daisywheel Printer. 200K Dual Disk Drives and manual and formatting disk.

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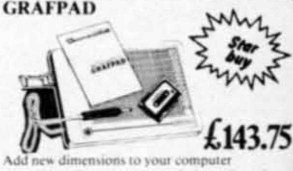

£143.75

Add new dimensions to your computer enjoyment. Create your own designs. Complete with Utility programmes. Amazing value. Complete unit — simply plug in.

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Ass Lang for BBC (Shiva)	£7.95
ALP (Macmillan)	£8.95
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Basic (Mel-House)	£6.95
Basic Progs for BBC	£5.95
Easy Progs for Your BBC	£5.95
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All you have to do is fill your requirements on a separate sheet of paper.
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All prices inclusive of 15% VAT. ADD £2.50 P&P for orders below £150. OVER, ADD, £8 P&P. CREDIT CARD HOLDERS MAY ORDER BY TELEPHONE. GIVE CARD NO NAME, ADDRESS & ITEMS REQUIRED.

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BBC M

Electronequip

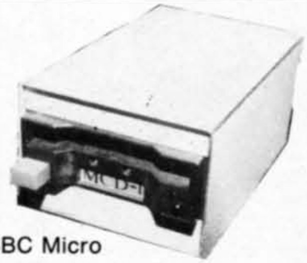
(Authorised BBC Dealer, and service centre)

Authorised BBC Dealer &
Service Centre

SPECIAL OFFERS

Electronequip is an authorised Acorn service centre and has been an Acorn dealer since the introduction of the Atom. Our demonstration facilities include 20 station Econet and Torchnet systems.

Ref.	BBC Mic	Ex VAT	Inc VAT
ANB01	BBC Model B Micro Computer	348.26	399.00
ANB02	BBC Model B with Econet Interface	389.14	446.00
ANB03	BBC Model B with Disc Interface	426.59	489.00
ANB04	BBC Model B with Disc & Econet Interface	467.45	536.00



3" Micro Disc £129.95 (inc. VAT)

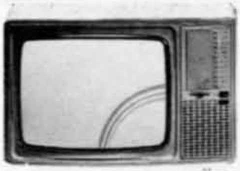
Disc Interface & Drive £198.95 (inc. VAT)

Micro Disc Drive for the BBC Micro

The Micro disc drive offers a method of low cost quick access to programs. The drive is essentially a small version of a 5¼" disc drive and offers similar features to the larger drive.
The data is stored on a 3" disc, this is enclosed in a protective hard plastic cassette which features a write protect switch.
The micro drive requires the standard Acorn disc interface, but a new disc filing system rom. Acorn DFS may be exchanged for the micro DFS for £12.00. The new micro disc filing system allows 60 files per disc surface and it can read and write to Acorn DFS discs. Thus if a 5¼ inch and a micro floppy were connected on the same cable files could be transfered between them.
Capacity: 80.64 K bytes **Transfer Rate:** 125kbit/s

TRADE ENQUIRIES WELCOME
Access & Barclaycard Accepted
Large Stocks – 24 Hour Despatch
Carriage 50p

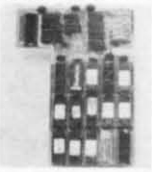
NORDMENDE



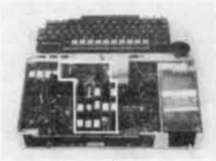
14" TV/Monitor £217.00 + VAT

Ref.	Monitors	Ex VAT	Inc VAT
MNCE370A	Cable CE 370A Colour RGB Monitor	169.00	194.35
MNKVIS2	Kaga 12" RGB Monitor Vision II (Medium)	285.00	327.75
MNKVIS3	Kaga 12" RGB Monitor Vision III (Hi)	399.00	458.85
MNM1431	Microvitec 1431 14" Colour Monitor (BBC)	199.00	228.85
MNM1441	Microvitec 1441 High Res 14" BBC Monitor	440.00	506.00
MNM1451	Microvitec 1451 Medium Res 14" BBC Monitor	299.00	343.85
MNN1534	Nordmende 14" TV/Monitor	217.00	249.55
MNN3534	Nordmende 14" TV/Monitor with remote control	234.00	269.10
MNN4430	Nordmende 20" Prestige TV/Monitor remote	417.00	479.55
MNN4432	Nordmende 22" Prestige TV/Monitor remote	458.00	526.70
MNN4437	Nordmende 27" Prestige TV/Monitor remote	512.00	588.80

SIDEWISE

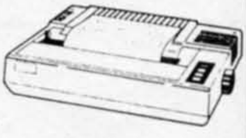


SIDEWISE FITTED



"SIDEWAYS" rom board for BBC Micro.
No soldering required £38.00 + VAT

EPSON



RX-80 FT £263.12 + VAT
FX-80 £365.09 + VAT
Printer price includes cable for BBC and screen dump rom is available for £7.50

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COMPUTERS
Perfectly Made in Britain

Ref.	Torch Computers	Ex VAT	Inc VAT
TDZ8DP	Torch Z80 Disc Pack (Dual 800K + Z80)	730.00	839.50
TC301	Torch Work Station (No monitor) (301)	1244.00	1430.60
TC303	Torch Work Station with TOSCA (No monitor)	1449.00	1666.35
TC401	Torch Computer twin 400K (new style)	2250.00	2587.50
TC403	Torch Computer twin 400K & TOSCA (grey)	2455.00	2823.25
TC68000	Torch Computer twin 400K Floppy & 68000	3550.00	4082.50
TC68020	Torch Computer 20Mb Hard Disc & 68000	5900.00	6785.00
TCF500	Torch Computer twin floppies (CF500)	2950.00	3392.50
TCFS500	Torch Computer twin 400K & TOSCA (CH500)	3150.00	3622.50
TCH520	Torch Computer 20Mb Winchester CH520	5650.00	6497.50
TCHS520	Torch Computer 20Mb Hard Disc & TOSCA	5850.00	6727.50
TMC240	Torch Colour Monitor (MC240)	575.00	661.25

ACORN COMPUTER

Electronequip

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Kings Lynn Branch
Tel: 0553 3782

BBC

If you're studying... Study our Software

We've been producing educational software for the BBC micro ever since it was launched, and our programs are in use in schools and colleges all over the country. Now, some of these programs have been specially adapted for you to use at home.

With our **Understanding Science** programs you can get to grips with subjects in Biology, Physics or Chemistry that you didn't understand, or supplement your practical work by doing simulated experiments on the computer. These programs are suitable for age 13+ and are ideal if you are studying for those all-important exams. The emphasis is on **understanding** the subject and the programs come with a detailed explanatory booklet. The first programs are ready now — with many more to follow.

Chemistry — Symbols, Formulae and Valency
Chemistry — Chemical Equations
Chemistry — Inorganic Analysis and Identification of Gases
Physics — The Oscilloscope and Waveform Analysis
The Human Body — Heart and Kidney

Each package costs £12.95 (cassette) or £13.50 (disc).

UNDERSTANDING
PHYSICS
BBC Model B
CATHODE RAY OSCILLOSCOPE WAVE FORM ANALYSIS
GARLAND EDUCATIONAL SOFTWARE
UNDERSTANDING
The Human Body
The Human Body
UNDERSTANDING
The Human Body
THE HEART and KIDNEY
UNDERSTANDING
CHEMISTRY
CHEMICAL EQUATIONS
John M Studd
GARLAND EDUCATIONAL SOFTWARE
LEARNING MATHS
MOTION GEOMETRY
SYMMETRY
FRACTIONS
electron / BBC

For younger pupils age 9+, our **Learning Maths** programs use simple games and animations to illustrate important principles of elementary Maths. There are nine titles — each containing three or more programs covering a particular concept. The programs are great fun to use — as well as providing real educational value.

Nine cassettes are available*

JM1 **Angles**
JM2 **Directed Numbers**
JM3 **Fractions**
JM4 **Co-ordinates and Lines**
JM5 **Symmetry**
JM6 **Motion Geometry**
JM7 **Sets**
JM8 **Elementary Statistics**
JM9 **Ratio**

Each cassette costs £7.00. Disc collections also available (JM1-6, £30.00; JM7-9 £18.00)

*Electron versions of programs JM1-9 and Dragon versions of JM1-6 also available.

Available by direct mail order, or from selected software dealers.
Prices include VAT and P&P (in UK).

Garland Computing 35 Dean Hill, Plymouth PL9 9AF. Tel: (0752) 41287

- The complete AMS disc drive package, tailored to your BBC micro, is compatible with all disc interfaces and includes cables, a comprehensive manual and utilities on either disc or EPROM. Housed in a steel case, matching the BBC micro, these reliable and robust Hitachi 3" disc drives are the ultimate for home, office and classroom.
- The 3" disc is totally enclosed in rigid plastic and a unique automatic steel shutter protects the delicate disc surface from dust and finger marks. For the first time discs can be used in industrial, educational and commercial environments without the worry of corrupting precious programs and data.
- The disc is "flippable" like a cassette tape and has a storage capacity of 100K on each side in single density mode (twice as much when used with a double density interface). A neat plastic switch can be flicked back and forth to write-protect valuable discs.
- The AMS disc drives are completely hardware and software compatible with 5¼" drives which can be used in parallel so allowing easy transfer of software. Consequently the 3" drives will operate with all the standard floppy disc interfaces. They take their power from the outlet provided by the BBC micro – there's no onboard power supply to corrupt data.
- The AMS package includes utilities on either disc or EPROM for formatting and verifying discs. The EPROM, which is easily fitted, offers a simple to use and permanent alternative to using the utilities disc.
- The impressively engineered Hitachi 3" drives feature an eject button allowing single handed operation, a multi-colour LED indicating the disc side in use, and a brushless direct-drive motor for reliable operation. The super fast track-to-track access time of 3ms is at the forefront of disc drive technology. The longest of programs are loaded in a flash.

Advance with AMS

3" Disc Drives – The Ultimate Choice

Recommended Retail Price

Single 200K – £199

(100K per side)

Double 400K – £385

(200K per disc)

includes VAT and delivery

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If not available from one of our 200+ dealers fill in the coupon and we will deliver your order promptly. Advanced Memory Systems Ltd., Green Lane, Appleton, Warrington WA4 5NG RING (0925) 62907 OR 62682.

Hitachi - in a word reliability

TO: Advanced Memory Systems, Ltd, Woodside Technology Centre, Green Lane, Appleton, Warrington Cheshire WA4 5NG.

Please send me:

☐ Qty AMS-3 (S) single disc drive all inclusive package at £199 each

☐ Qty AMS-3 (T) twin disc drives all inclusive package at £385 each.

Prices include utility disc, cables, manual, VAT and delivery.

Please send me by post, if not with drives:

☐ Qty double sided (100K x 2) discs at £4.95 each.

☐ Qty packs of five at £22.50 per pack.

☐ Qty Formatting and Verification Utility EPROM £17.25.

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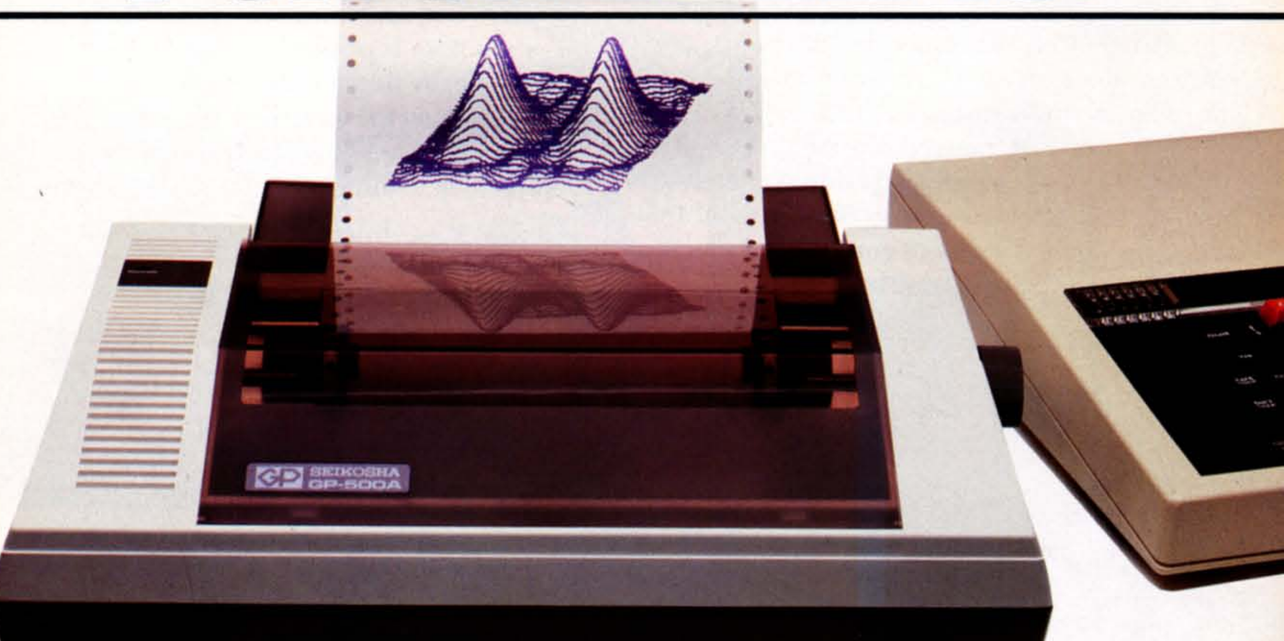
WHAT'S ON BBC?

READ ALL ABOUT IT FOR ONLY £249.



Even with such a versatile workhorse as your BBC Micro, you've got problems.

For example, supposing you want a permanent record of important graphics? Or need to eliminate glitches from a lengthy program? Fast.

Without a printer you're stuck.

And up to now, even if you had a printer that could play in the same league as your BBC, you were stuck - with a price tag running into three or four hundred pounds.

The Seikosha GP500A changes all that.

It's got full graphics capability, with a single command enabling you to repeat a column of graphic data as many times as you like.

Its printing speed is 50 characters a second in an 80 column dot-matrix format on standard width paper adjustable up to 10 inches.

And under its sleek casing, there's a wealth of sophisticated features. Like automatic printing (no data lost due to overflow), intermixing of all modes on a single line and printing of one copy as well as the original.

All for only £249.00.

No, you didn't misread. The Seikosha GP500A complete with BBC interface cable costs only £249.00.

See the GP500A in action - phone for details and the address of your nearest dealer.

SEIKOSHA **DRG**

DRG Business Systems, Peripherals Division, 13/14 Lynx Crescent, Winterstoke Road, Weston-super-Mare, Avon BS24 9DN.
Telephone: 0934 419914. Telex: 444761.

Small business can now stop going by the book.

For under £1,000 a small business can now equip itself with a BBC Microcomputer, a disc drive, a word processor and printer.

(All tax deductible by the way.)

Once you've parted with that money, you'll find that business has never been brisker.

Because now, there's a new series of floppy disc software specially for the smaller business.

It has been developed by Acornsoft, the software division of Acorn Computers who are the manufacturers of the BBC Micro.

For only £24.95, each disc can store volumes of vital bookwork which can be updated and amended in a fraction of the conventional time.

And there is a disc to cover most aspects of paperwork and book-keeping.

The Invoicing package.

This program stores details of products, VAT numbers and, of course, the names and addresses of your customers. As orders come in, you simply record them. Then, when it's time to invoice, you just press a few keys and each invoice or credit note is printed automatically in seconds.

Allowing for variable terms of trading, the system calculates and prints discounts. And it should help to improve your cash flow dramatically.

The Order Processing package.

With this program, you can confirm your customers' orders, prepare and print despatch notes and make fast analyses of individual orders or of all the orders stored on disc.

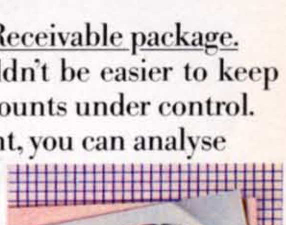
ORDER PROCESSING

The Accounts Receivable package.

Now, it couldn't be easier to keep your customer accounts under control.

In an instant, you can analyse debtors, produce statements, keep a check on any credit limit and calculate VAT output automatically.

Using this package in conjunction with the invoicing package, you can also keep tabs on payments received against payments outstanding.



The Accounts Payable package.

This package will keep you fully up-to-date on how much you owe and who to. In addition, it calculates

ACCOUNTS
PAYABLE
ACCOUNTS

input VAT and, used with the Accounts Receivable package, produces instant VAT returns.

It also highlights settlement discounts, produces remittance advices and provides an immediate analysis of all creditors.

The Stock Control package.

-STOCK-
CONTROL

Touch a few keys and you have instant access to stock status and automatic analysis by quantity and value.

Consequently, it's easy for you to maintain correct stocking levels, having an early warning of out-of-stock situations or the likelihood of over-stocking.

The Purchasing package.

Purchasing

All your suppliers' names and addresses go onto the disc. Then they can be retrieved instantly for preparing and printing orders.

All order data can be recalled in seconds, allowing you to check on orders, and suppliers' invoices and to record all deliveries.

The Mailing package.

Mailing
System

Instead of the shotgun method of sending mailshots, this package enables you to refine each mailing down to the customers who are most likely to respond.

It gives you a rapidly accessible mailing file of your customers, according to any criterion you choose. Size of company, for instance, or type of business. Average value of the business they do with you, or whether they are good or bad payers.

Then, when you are doing a mailing, you simply choose the group or groups of customers you want.

At £24.95 each, these packages could be priceless.

Each package comes with clear instructions on how to get the program running so that you can devote much more of your time to more profitable activities.

If you're a credit card holder, you can order any or all of the packages by ringing: 01-200 0200 anytime. Or 0933 79300 during office hours.

(By ringing the same number, you can get the address of your nearest stockist, or full details of the BBC Microcomputer system if you don't already have one.)

Alternatively, you can order the packages by sending the order form below to: Acornsoft, c/o Vector Marketing, Denington Estate, Wellingborough, Northants NN8 2RL. Please allow 28 days for delivery.

☎ Credit card holders, phone 01-200 0200, anytime. Or 0933 79300, during office hours.

To: Acornsoft, c/o Vector Marketing, Denington Estate,
Wellingborough, Northants NN8 2RL.

Please send me the following business software packages at £24.95 each.

PROGRAM	QUANTITY	TOTAL	(Code Acornsoft use only.)
Invoicing			SNB 08
Order Processing			SNB 12
Accounts Receivable			SNB 10
Accounts Payable			SNB 13
Stock Control			SNB 11
Purchasing			SNB 14
Mailing			SNB 09
	TOTAL		

I enclose PO/cheque payable to Acornsoft Ltd. Or charge my credit card.

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Please send me details of the BBC Microcomputer System ☐

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ACORNSOFT

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Whether its your first computer or whether you're already an enthusiast, LVL COMPUTERTOWN offers you the quality of service you expect from experts. If you invest money, you go to a bank or a broker - a specialist who can guide and advise you on the best return for your capital. At LVL COMPUTERTOWN we're specialists too. We're there to help guide you through the micro maze, keep you up to date on innovations, help you get the best value for money, whether your computer is for you, your children or your business. Your computer can change your life - make sure you change it for the better:
Come and talk to the experts and move into micros with LVL COMPUTERTOWN

COMPUTERS

ACORN electron

The new personal computer from Acorn Computers. An ideal machine for learning computing - and for having a lot of fun at the same time. But it's much more than just a toy. It's graphic facilities are the most sophisticated available in it's price range.

£199.00

BBC MICROCOMPUTER

MODEL A	£299
MODEL B	£399
MODEL B with ECONET	£446
MODEL B with DOS	£469
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MONITORS

DECCACOLOUR
14" Colour Monitor

£247.25

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£274.45

MICROVITEC
14" Colour Monitor

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12" Green Screen

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Silver Reed EX550 Parallel	534.75
Silver Reed EX550 Serial	569.25
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Epson FX80	503.70
Epson RX80 (F/T)	366.85
Epson MX100 (B2 Col)	546.25
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A REFLECTION OF SUPERIORITY

The Bell & Howell/LVL Computer Compatible Data Recorder

£39.95

- ○ Automatic Level Control
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An example of superior technology, total reliability and outstanding performance, combine to produce the LVL Disk Drive Family.
Truly professional units designed to work with the BBC Microcomputer.

CHECK OUT NEW LOW PRICES WITH YOUR NEAREST DEALER.

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DESIGNED FOR THE BBC MICROCOMPUTER

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Hopper
for the BBC Microcomputer Model B

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ALL PRICES INCLUDE VAT.

The items featured represent a very small selection from our vast product range, and at the time of going to press where all available from stock.
However, not all dealers carry every advertised item, please telephone before making your journey.
Further information of both product and services available can also be obtained by telephoning or visiting your nearest LVL Computertown Dealer.

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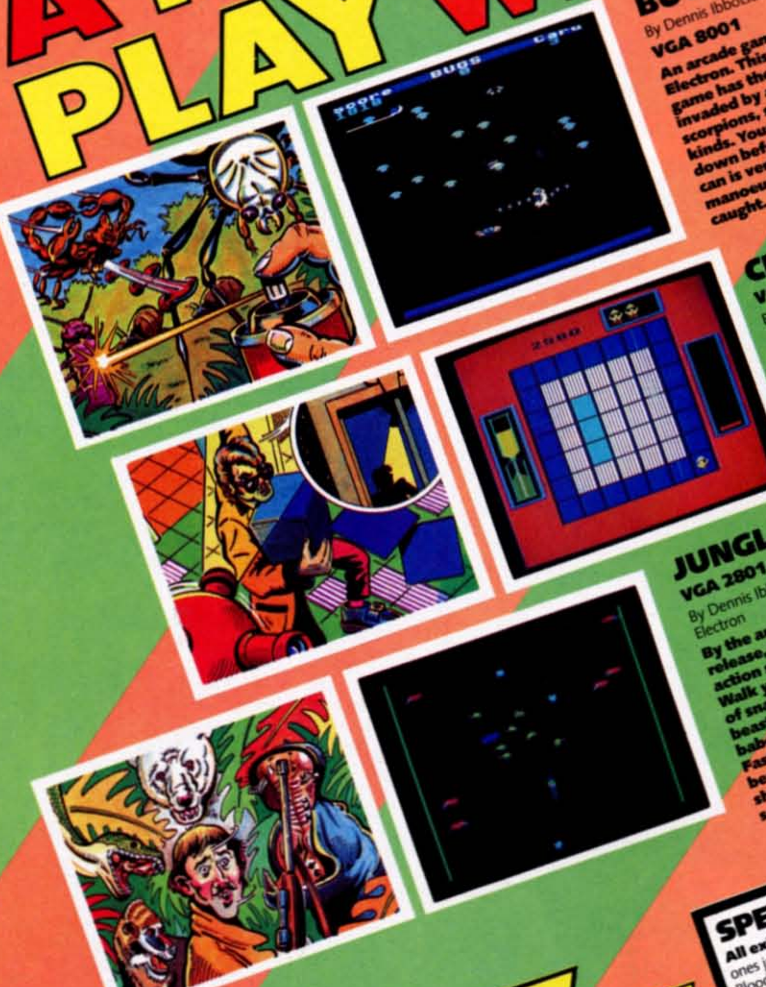

BUGS

By Dennis Ibbotson for the Electron

VGA 8001

An arcade game for the new rare Electron. This fast-moving arcade game has the players' garden being invaded by a whole host of nasties, scorpions, spiders and bugs of all kinds. Your job is to shoot them down before they get you. Your spray can is very fast and very manoeuvrable, but you can still get caught.

CHECKOUT

VGA 2011

By Mike Cooke for the BBC B

A unique game that keeps your heart beating fast. Charlie the Checkout burglar dashes round the store collecting carpet tiles, a robot guard with lasers tries to stop him. This grid walking game is a must for quick-thinking, fast-fingered players.

JUNGLE JIVE

VGA 2801

By Dennis Ibbotson for the BBC B and Electron

By the author of another new release, Bugs. Jungle Jive is fast action shoot'em up arcade game. Walk your hunter between the lines of snapping, snarling and slithering beasts. Shoot them all but not the baboons, and especially the snakes. Faster action as you progress. But beware the ricochet – you could shoot yourself! Stunning use of sound and colour.

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THE MICRO USER

MAY 1984

NEWS

Acorn export bandwagon is rolling

A DRAMATIC breakthrough by Acorn on the export front has resulted in a forecast that overseas sales this year will account for up to 15 per cent of the group's turnover.

Such is the company's current success story abroad that *The Micro User* has learned that it will have opened up eight new foreign markets by the summer alone.

"We are going from strength to strength", said Bob Bayham of Acorn International, the organisation formed little more than a year ago to spearhead the export drive.

"By the end of the year, we expect exports to make up from 10 to 15 per cent of Acorn's revenue".

The company has yet to announce details of its eight new markets but *The Micro User* is reliably informed that three are in Europe, two being Italy and Spain.

Acorn has already established two overseas subsidiaries – in the United States and Germany – while the remaining markets will be handled for the time being by appointed distributors.

The US operation is expected to start paying real dividends in the second half of this year as orders already taken there are well in excess of 50 million dollars.

More than 1,000 dealers have been appointed in North America to sell the BBC Micro and the American subsidiary has also established an educational advisory board to vet software for the machine out there.

Business users get a boost

BUSINESS software for the BBC Micro has received a powerful boost with the release of new programs from Acorn and Clares.

BetaBase, from Clares, is claimed to be the most powerful database yet for the BBC Micro.

A disc based system, it can handle over 2,000 records with a maximum of 200 fields, each of up to 254 bytes.

On entering the parameters of a file, BetaBase formats the disc to the required number of records.

Meanwhile, Acorn have finally released its long-promised suite of business software for the BBC Micro.

Officially titled 'Small Business Programs', the intention is to offer a comprehensive range of accounting, invoice and stock facilities essential to the small firm.

Air ace flies again

BATTLE of Britain fever gripped London again when a wartime fighter ace scrambled to take to the air in a Spitfire.

Only this time Air Vice-Marshal Sandy Johnstone didn't leave the ground, for it was all achieved on a BBC Micro.

The occasion was the launch of the world's first home computer Spitfire flight simulator – the Aviator – developed by Acornsoft.

In what guests described as "a press relations masterstroke", the event was held in the Battle of Britain Hall at the RAF Museum in Hendon, with a real Spitfire in the background.

Air Vice-Marshal Johnstone, who commanded the world famous 602 Squadron during the battle, accepted an invitation to try his hand at the new game.

SOFTWARE PIRATES ON THE AIR

SOFTWARE pirates, always ingenious in thwarting the protection attempts of manufacturers, have begun to use the radio waves to distribute their illicit copies.

Radio hams have started to use their sets to transfer software directly to each other.

The whole operation is beginning to become highly organised.

Ringleaders frequently broadcast catalogues of hundreds of programs from which other hams can take their pick.

Estimates of the amount of software pirated this way range from £5 million to more than £20 million.

The practice came to light when Rochdale-based A&F Software began to monitor transmissions.

Said managing director Mike FitzGerald: "We were amazed at the scale of the operation. It's not just games – the other night they were talking about sending Acornsoft's View over the air.

"Rest assured that we will take action against anyone pirating our programs in this way.

"We've already got a list of call signs, and if the offenders don't stop

Turn to Page 24

Spring launch for Second Processor

THE coming of spring saw the launch of Acorn's long-awaited 6502 Second Processor, an expansion device which converts a standard BBC Micro Model B into a high speed dual processor system.

This means that the Model B takes care of all the screen and input/output handling while the Second Processor runs the program proper.

In effect, the BBC Micro acts as a terminal, controlling the graphics.

The usual trade-off between the amount of memory available for running programs and the graphics definition is thus avoided.

Attached to the micro by the tube interface, the Second Processor consists of a 3mHz 6502 chip and 64k of user memory, running 50 per cent faster than the BBC Micro.

Up to 44k of the Second Processor's memory can be used for Basic programs, with a massive 60k available for assembly language programs.

Two ROMs come with the package. The first is the 16k "Hi-Basic" chip which provides the Basic for the Second Processor.

The second ROM updates and replaces the user's disc or Econet filing systems with a single chip.

Acorn claims that the Second Processor out performs all other home and personal computers currently available – including 16 bit and 32 bit machines.

The unit, complete with the two ROMs and User Guide, costs £199.

Despite Acorn's assurances that the Second Processor is available now, dealers have been told that it will be several weeks before they are in the shops.

... and Bitstick opens way to CAD

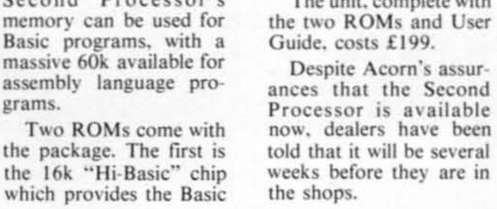
THE BBC Micro has entered the field of computer-aided design with the launch of its Bitstik.

Basically a precision three axis joystick with software, it uses the speed and power provided by the 6502 Second Processor to provide a low cost computer-aided drawing facility.

The menu-driven Bitstik allows wide and easy control over the creation and manipulation of onscreen drawings.

Lines, curves and circles can be drawn in three user-selected colours with "painting" available in four colours and twelve shades.

An outstanding feature of the Bitstik is its ability to zoom and pan in on a drawing, allowing it to be magnified and displayed to virtually any degree.



The Acorn Bitstik system

Also individual elements of the picture can be moved, copied, enlarged, shrunk, reversed and reorientated as needed.

Finished drawings can be saved onto disc, each holding up to 48 pictures which can be displayed on a pictorial index.

An in-built dump facility enables screen images to be printed on Acorn's Sparkjet Printer.

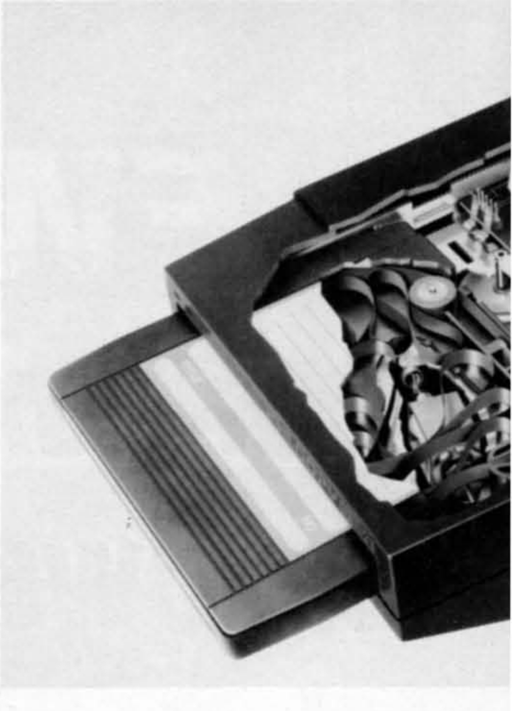
The graphics software for the Bitstik is held on a ROM chip, while the system master utilities are provided on an 80 track floppy disc.

The entire system, consisting of Bitstik, BBC Micro, high resolution colour monitor, 6502 Second Processor and 800k disc drive, costs under £2,000.

PERSISTENT rumours that Acorn is about to drop the Econet local networking system have been strongly denied.

"Far from dropping it, we are still developing Econet and will continue to develop and support it for quite some time", said an Acorn spokesman.

As a proof of this comes the Level II Econet fileserver, an update on the Level I which allows, among other things, the use of random access files and password protection.



Enter the

A NEW and revolutionary mass storage system for the BBC Micro called Phloopy has just been launched by Phi Mag systems of Falmouth.

Aimed at BBC Micro owners who want to save their programs on something faster than cassette tapes but can't afford discs, the Phloopy uses a 12-foot loop of $\frac{1}{4}$ inch magnetic tape.

The system consists of the Phloopy drive itself, an interface to the BBC Micro and ROM based software.

The tapes come in

Software pirates

From Page 23

they'll have injunctions served on them to close down their stations".

Contacted by *The Micro User*, the Radio Society of Great Britain said it had no knowledge of any of its members being involved in piracy.

"We know that some of our people are programmers and send their programs over the air – which is quite legitimate", said David Evans, the society's secretary.

"But obviously we would not expect amateurs to broadcast any material where copyright law exists".

A&F seem to be leading the fight against piracy and other abuses – to such an extent that their solicitors have just had to dissuade Acorn themselves from using unauthorised copies.

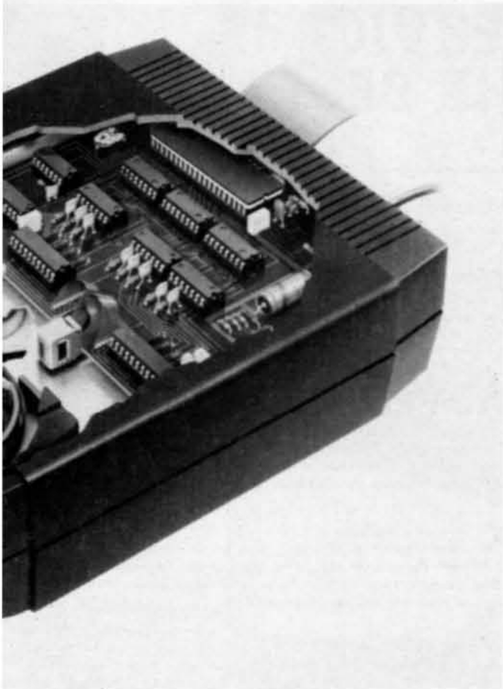
At a recent Acorn Roadshow they were found to be using a disc copy of A&F's best selling Chuckie Egg in their display.

Said Mike FitzGerald: "It was obviously an unauthorised copy as we don't do a disc version. On top of that, the code had been altered.

"If they'd asked permission they could have used the program – it's good publicity.

"But it's bad publicity when they have the audacity to change code and use a non-standard version".

An Acorn spokesman told *Micro User* they had no knowledge of this happening, and if it did happen they believed it wasn't any of their doing.



100k Phloopy

cartridges, each of which can store 100k of data

Phi Mag claim that their tape loop system scores over other such systems in its reliability.

This is the result of the "byte-wide" magnetic head used to read and write to the tape.

The head reads nine tracks across the width of the tape, instead of the usual single track.

This allows a shorter tape loop and, hence, faster access times.

The time to access a file can be as little as three seconds.

CABLE TV PUSHES COMPUTER GAMES

THE MICRO market may shortly make another sharp change in direction.

By the end of this year, computer games will start to pour into the homes and TV sets of a growing number of cable subscribers.

And at a rental of around £10 a month, industry observers predict a down-turn in business for retailers of micros and software.

Three companies are now wooing the cable operators – all with basically similar plans.

British Telecom proposes to lend each of its cable subscribers a Spectrum complete with joystick and a choice of 20 games and educational programs.

Thorn EMI offers a software-only option for owners of micros such as the BBC, Apple and Sinclair.

And high-street retailer W.H. Smith has a tie-in with The Games Network, already a big name in America. The deal will include a Japanese-built micro, and will also feature more than 20 programs.

But games are only the tip of the iceberg.

All three companies expect that once they have a foot in the door it will lead to home word processing, banking, shopping and electronic mail.

And W.H. Smith is working on a range of software aimed squarely at the small businessman.

Robot pingpong is on the way

BRITISH and American robots are set to play each other at pingpong in 1986.

The Robot Pingpong Contest, dreamed up by Dr John Billingsley of Portsmouth Polytechnic, will pit computerised robots against one another

Contest organisers think that sensors enabling robots to "see" the ball and return it will be available within two years.

They also believe most of the contestants will be built by hobbyists

The first British "friendlies" will take place later this year.

And American robotics fans are expected to take up the British challenge at the International Personal Robot Congress and Exposition this month in Albuquerque, New Mexico.

Enquiries

Meanwhile, British contestants can get a fact sheet from Dr Billingsley.

Already he has had around 30 enquiries from budding robot builders – including one who wants to control his robot with a mainframe!

But Billingsley thinks most will be masterminded by humbler gear such as the BBC Micro. And robot size will be limited by its having to stand on a one-metre square.

"After all, we don't want the contestants too big" he said. "Just imagine what would happen if a big one got out of control".

* * *

HOBBIT publisher Melbourne House has brought out a "Guide to Playing the Hobbit" at £3.95.

Ian McNaught Davis, left, and Paul Vaughan try champagne opened by computer-controlled robot.

Chips pop the cork

A LEADING manufacturer of peripherals for the BBC Micro officially opened its new £150,000 headquarters recently with a ceremony where the champagne cork was fittingly popped by a computer.

Broadway Electronics of Bedford also marked the event by predicting that it will create up to 50 new jobs in the next two years.

The success story of the four year old business which now has a turnover in excess of £1 million – began when managing director Paul Vaughan failed to clinch a sale.

Acorn Computers did not want to buy Paul's components. But instead, he decided to stock their computers at his tiny Bedford shop.

"It was a major turning point", he explained. "When the BBC Micro was launched, we established a reputation with schools and colleges within a 50 mile radius as a servicing agent.

"Then a year ago, we began to design and manufacture peripherals for Acorn to give us a measure of product independence".

Ian McNaught Davis of BBC Television's programme, "Computers in Control", was on hand to assist with the official opening.

Plug-in processor

CAMBRIDGE Microprocessor Systems has introduced a single board plug-in second processor for the BBC Micro.

It is designed to enable software houses and engineering departments to develop new hardware and software, and as a teaching aid in further education.

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FORTRESS

Too new for reviews, this **'ZAXXON'** -type game works beautifully on your Beeb. As Pace say ... the Fortress awaits you. it is a classic computer game, in a smashing 3D graphic form. All the features you would expect, plus a Hall of Fame. Fast and furious. STIX OK. (**Pace**) **£8.95**

POOL

A very realistic simulation in this game for two players. (With very good Scott Joplin music, too!) You can play solo to perfect your technique. Excellent and smooth hi-res colour graphics make the full-screen table a pleasure to play on. You control the cue angle and strength of shot and can get it down to a fine art. Choose the frames to play, too. Great display: very satisfying program. NO STIX. (**Dynabyte**) **£7.95**

LORDS OF TIME

"Some of the most intriguing puzzles I've come across ... not to be missed". (Home CompWkly) "Executed with wonderful style ... highly recommended". (PopCompWkly)
In this text-puzzle adventure you must collect 9 objects, each marked with an hourglass, from different timezones - from the Ice Age to the Space Age. 200+ locations, 750 messages, 80 objects, vocabulary over 200 words. Beautifully written and more sophisticated than ever.
NO STIX (**Level 9**) **£9.90**

MAGIC ADVENTURE

The first, and very beautiful, graphic adventure for children up to about 8 years old. Simple to operate - with an overlay for the User Defined Keys, but intriguing to play. Meet The Talking Tree, open the cage - maybe: count the rabbit's babies: can you get into the Fairy Castle? Great sound too and simple but very imaginative graphics. Loved by children in 57 primary schools already! We think it's, well, magic!
NO STIX. (**Kansas**) **£7.95**

VAMPIRE CASTLE

A brand new and surprisingly spine-chilling text adventure with some of the best music we've heard and a few graphics. The sounds and music are really great and the adventure is very well-written indeed. As a humble villager, you explore the dreadful castle, smell the musty smells, watch out for the eyes peering from the gloom. Save feature, of course. But it may not save your life! NO STIX. (**Micrograf**) **£7.95**

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SPACE ADVENTURE

"One of the best of the new generation of adventures ... challenging and exciting" (BBC File) "The smoothest graphics I have ever seen" (Beebug)
Absolutely amazing graphic adventure as you explore the 90 rooms of the drifting spaceship to find the keys to the rooms where the power capsules are hidden. 10 command keys: 3 skill levels: 8-way movement. One of the games we come back to again and again.
STIX OK. (**Virgin**) **£7.95**

VORTEX

"A fast exciting game with some of the better 3D effects ... recommended" (PCGames) The newest game from the author of 3D BOMB ALLEY (£7.95) takes you on a 3D voyage into space as you are slowly drawn towards the black void. Seek the aliens, dodge the asteroids, as the Vortex drags you relentlessly towards itself ... stunning b/w full-screen very fast 3D graphics and great sound. STIX OK.
(**Software Invasion**) **£7.95**

PINBALL ARCADE

"As professional a piece of software as you are likely to find ... the graphics are exceptionally good" (C&V Games) **DESIGN YOUR OWN PINBALL TABLES!** One example is included, but the fun is designing, playing and saving your own. You can add or take away or move 38 different features - springs, wires, flashing lights, bumpers. Alter their scores, their bounce. Alter the flippers, even tilt the table. Change just about everything, quickly and easily. Then play with the results. Be your own Pinball Wizard.
NO STIX. (**Kansas**) **£9.90**

BIRDIE BARRAGE

"Very little to fault ... well-presented, and as accurate as you're going to get". (PersCompNews) The best golf game we've seen for the Beeb. Acorn Park Golf Course has 18 holes, 72 par. You have a full bag of clubs and full screen graphics to play with. Set direction and power of each shot very accurately - and watch your ball in flight. Special detailed display when you reach the green. Wind strength, direction, changes between holes. NO STIX. (**Computasolve**) **£7.95**

TWIN KINGDOM VALLEY

"Sure to become a classic ... an involved and difficult adventure ... the excellent graphics add to the enjoyment". (MicroAdventurer) Not only a great adventure, but all 175 locations are drawn in hi-res graphics - and some of the beautiful drawings contain clues. 36 commands: realtime adventure with 6 control options. Rapidly becoming OUR BEST-SELLER! NO STIX. (**Bug-Byte**) **£9.50**

CYLON ATTACK

"Stands head and shoulders above the rest" (Acorn User) "Excellent ... the standard by which other games will be judged" (Micro User). "A superb program with excellent graphics" (CompChoice) You will really believe you are launching from and docking with a mother ship: you will see and feel you are refuelling: you will know exactly when you can kill the enemy. UNIQUE 50-PLACE HI-SCORE TABLE CAN BE SAVED. Great. And 3D, of course.
STIX OK. (**A & F**) **£7.90**

TRENCH

"It's very hard even at skill level one ... a challenge to your skills". (A&B Comp) "Manna from heaven" (PersCompNews). One of the most exciting games we've ever played. Fly your Beeb X-wing Fighter down the 3D Trench towards the Death Star-style target, dodging the tie-fighters as they attack. 9 skill levels: sensational graphics: one of our best sellers. STIX OK. (**Virgin**) **£7.95**

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When a BBC micro spells hope..

A POLICEMAN'S lot isn't always a happy one.

Like the time PC Colin Sanders, of the Greater Manchester force, realised that his son Andrew was not like normal children.

For the sad fact is that 10-year-old Andrew is handicapped.

"Looking back, the signs were always there", recalls his father. "He was late when it came to crawling, walking and talking. I suppose we didn't want to face up to it.

"So it wasn't until after nine months at primary school followed by transfer to a special school that his mother and I had to come to terms with the problem".

Like most parents in the same situation, Colin Sanders and his wife lived in hope of a miracle which would enable Andrew to show some real improvement.

Now they are convinced he is on the verge of a breakthrough – and it's all thanks to the micro revolution.

For since Andrew was introduced to a BBC Micro he has come on in leaps and bounds.

His concentration has intensified, his coordination improved substantially and he has recently mastered the ability to count from one to ten.

The youngster first got hands-on experience of the computer at the Hawthorne Special School in Denton near Manchester. It was on the advice of his headmaster that his parents decided to buy one for him at home.

As always however, money was the problem. But Colin was so convinced that the computer was vital to his son's wellbeing that he was prepared to sacrifice the family car.

However officials of the Police Benevolent Fund got to hear of the story and stepped in with cash to buy a BBC Micro.

"We have been delighted with the results ever since we got it home", Colin told *The Micro User*. "Every evening he goes on it for a while, and he has already shown all round improvement".

As they watch their son improve day by day, the Sanders are filled with gratitude for the help they received.

"To the Police Benevolent Fund, I offer my heartfelt thanks", says Colin. "I now hope and pray that the BBC Micro will turn out to be the best buy of my life . . ."

Government aid is a Buggy-booster

A PLAN to give pound-for-pound government aid to secondary schools for buying computing equipment is boosting sales of the BBC Buggy, reports Economatics, maker of the robot.

The scheme also applies to printers and upgrades for the BBC Micro.

It is administered by the Council for Educational Technology, which acts as a clearing house for bulk orders.

Equipment bought under the scheme is paid for with cash from the Department of Trade and Industry. Schools are then invoiced at half price.

This means they pay about £60 for a buggy.

Economatics expects these low cost buggies to establish a grass roots interest in robotics, just as the BBC Micro sparked off a nationwide computer boom.

The DTI hopes that by the time the scheme ends in July every secondary school will have a Buggy.

After July, further sales will go through the normal dealer network.

In anticipation of a growing robotics boom, Economatics is working on add-ons. A pen kit is to be released later this month followed by a grab arm.

Some higher education establishments are also buying the BBC Buggy, even though they do not qualify for the DTI rebate.

Party line

WIGAN Labour Party is putting all its records onto a BBC Micro database system.

Beebriefs

THE BBC Micro is now fourth in the home micro charts. Just ahead, in third place, is the Commodore 64.

Sinclair's Spectrum and ZX81 have a combined one-third market share. Sales of two million home micros are forecast for 1984.

★ ★ ★

RME Diamant has brought out a series of BBC Micro programs for builders. Typical subjects are U-value calculation, heat loss and insulation depth.

★ ★ ★

Philips has launched a 12 inch monitor at £70 for micros, including the BBC.

★ ★ ★

Acorn's forthcoming BBC-based business computer will have two built-in floppy discs, beefed-up CPU, and sell around £900.

★ ★ ★

13,000 pirated computer games were seized by police in Manchester.

★ ★ ★

Acorn will launch a computer-aided design workstation this year.

★ ★ ★

Newsbox has designed a system based on the BBC Micro for newsagents.

★ ★ ★

Cyber Robotics is offering a five axis robot for use with the Forth language on the BBC Micro.

★ ★ ★

Acorn has set up a venture capital fund for small high-tech companies in the Cambridge area.

SCREENPLAY

£200 COMPETITION

SCREENPLAY offers anyone who buys the ANIMATOR for the DRAGON 32/64 or the BBC Micro, the chance to recover the cost and a whole lot more.

All you have to do is to write an original program using the SPRITES from the ANIMATOR. Programs may be written in basic or machine code.

The winning program will be published by SCREENPLAY and the author will receive £200 cash plus royalty payments, subject to SCREENPLAY standard terms and conditions, a copy of which can be obtained by request.

Even if you don't win the £200 cash prize, if your program is of high enough standard, you could be making MONEY before the closing date of the 1st September 1984, by having your program published by SCREENPLAY.

Rules of the competition and entry forms are included in the package. All entries will be acknowledged.

THE ANIMATOR is a sprite GENERATION package for the BBC MICRO and THE DRAGON 32/64. The sprites produced have collision checking facilities built in and can be moved around the screen from your own basic or machine code programs.

The programs are supplied in a box with a comprehensive manual and demo programs. Details of each product are given below.

SPRITE FEATURES INCLUDE:

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Micro games go on video

A VIDEO show has been made about computer games.

Christ Tarrant introduces the 35 minute programme, which shows 32 computer games, ranging from animated soccer to outerspace adventures.

It shows what's on the market and explains how to play them.

The games were recorded without a camera directly from the games computers – BBC Micro, Spectrum, Oric, Commodore – onto video tape.

The idea is to let people sample games before they buy. The video is available for sale or rental from leading dealers.

Sophisticated CAL made easier

AN authoring system for the BBC Micro that enables non-programmers to write sophisticated computer-aided learning programs has been launched by Acornsoft.

Called Microtext, the new system simplifies the production of "man-computer" dialogues for a wide range of applications, particularly in education and training, expert advice and information retrieval and gathering.

Microtext is aimed at the non-computer expert, requiring only a basic knowledge of the BBC Micro to produce sophisticated computer-aided learning (CAL) systems.

Feature

All have text and graphics, response handling, decision making and branching.

A key feature of Microtext is its "frame" structure. Each frame represents a screen of text and graphics, together with control commands to govern frame sequence.

A series of frames builds up into a module, whose size is limited by available computer memory.

However a single Microtext program may be constructed from more than one module – as many as there are room for on the user's cassette tape or disc.

Microtext also supports sound and hi-res graphics, and can even control devices such as slide projectors and videotape recorders through the BBC Micro's user port.

Versions

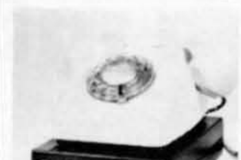
Microtext was developed by the National Physical Laboratory. It is currently available on cassette or disc.

ROM-based versions are to follow.

A publishing version of Microtext, to enable application programs to be securely distributed and reduce user memory requirements, is also planned.

The system comes complete with comprehensive documentation.

This includes authoring guide, reference card, function key strip, and a "welcome" guide to the nine demonstration programs included on the cassette.



THIS modem links the BBC and other popular micros to Prestel, Micronet 800 and similar viewdata services.

The Telemod 2 sits beneath the telephone.

It connects to the phone line via the BT module extension socket and will connect directly to the BBC and most other micros via an RS232 or serial port.

SYMBNET FOR SCHOOLS

A NEW version of Symbiotic's Symbnet has been developed to enable teachers to use the BBC Micro for full local area networking.

The system is said to require no great computer knowledge.

BBC Symbnet uses the same fibre optics as earlier versions. It is compatible with Acorn DFS and with the tube.

NDOS (Network Disc Operating System) will run Acorn DFS software without modification, even most protected systems.

Acorn DFS ROMs are not required.

All BBC Micros have full access to the network and none are tied up as file servers.

Each Symbnet disc drive – a Winchester is treated by the system as several floppies – can be either global or private for read only or read-write access.

The system manager is kept on floppy disc. It allows configuration of the system for such operations as automatic downloading of programs and files when students log on.

Electronic mail is also part of the system, although student use is restricted.

Symbnet allows project identities to be given to groups of users. They may be used as addresses for messages and the teacher can also send messages to individual users, groups, or to all users of the network.

Full printer spooling is available so that any print can be dumped to disc without any coding change.

Maximum distance between network stations is 9km without enhancing the signal.

Secrets on top

BBC Micro fans who are looking for something a bit different can now buy a system that will let them eavesdrop on secret radio transmissions.

The breakthrough comes from Microcentre of Bognor Regis. Their method enables anyone to decode morse, and signals from press agencies, Interpol, embassies and other users of long-distance short-wave broadcasts.

The transmissions sound like high-pitched whistles but in fact contain messages.

No knowledge of morse is needed, because a decoder translates the signal into plain language for display on a monitor screen.

However the price of around £1,000 is likely to deter all but the keenest.

Hobbit speeds up

AT Ikon Computer Products, makers of the Hobbit tape drive, top man David Tucker is busy taking orders from BBC Micro users for his Ultra-Drive.

The new machine, like an improved Hobbit, holds nearly twice the amount of data – 200k.

It is also claimed to give twice the speed – 1,200 bytes a second.

Ikon are planning to offer a factory upgrade which will put Hobbits into the Ultra-Drive class.

BP 'build-a robot' challenge

BP Oil has challenged Britain's schoolchildren to roll up their sleeves and tackle the household chores – with a robot.

Winning schools can clean up prize money totalling about £3,000.

The BP Buildarobot competition offers two routes to the finals at the School of Electrical Engineering, Arborfield, Reading, in October next year.

One challenges schools to design and construct a freestyle robot to perform a useful domestic task.

The other, for schools who prefer a set challenge, is to build a mobile robot butler to serve a drink to two people seated in a room.

Competitors, who must be under 19 on August 31, 1985, can enter one or both categories.

Regional finals will decide who goes through to the national finals.

The first BP Buildarobot competition had its finals last year and the standard of entry won praise from Minister of State for Industry and Information Technology, Kenneth Baker, who presented the prizes.

Bank managers are training on the BBC micro

BANK managers from all over the country have been climbing out of their cupboards, casting aside bowlers and brollies in their rush to get to grips with the BBC Micro.

They are all making their way to the Bank of Scotland's staff training centre in Edinburgh where they are being given the opportunity to work with a new network.

Designed by consultants Commscot, the system combines the BBC Micro with the Torch Z80 dual disc drive and Torchnet to provide a low cost flexible network.

Torchnet not only enables individual work stations to communicate with one another but also to share the use of relatively expensive additional equipment.

"We have always believed that our branch managers should be in a position to offer something a bit more practical than sympathy", said Stewart Henderson, manager of the bank's training department.

"The objective of our investment in this installation is not to turn our managers into technical consultants or advisers, but to develop and heighten the awareness which already exists of the areas in which microtechnology can be of assistance to our customers".

Ghost walks in a micro store

THE BBC Micro's pulling power now apparently stretches beyond the grave.

For the ghost of electronics pioneer Sebastian de Ferranti materialised in a northern town recently just to get a glimpse of the machine.

Complete with silver topped cane, tailcoat and bowler hat, the apparition of the Victorian genius dropped into the Wilmslow Micro Centre, Cheshire, to see for himself the results of his visionary dreams of a century ago.

It was all for the benefit of a government film unit which had resurrected the 19th century gentleman in the form of actor John Rankin for a television programme about the micro revolution.

The film, which has been booked by 60 TV stations around the world, aims to highlight the enormous progress made since the days when de Ferranti became a pioneer in the large scale use of electricity.

Born in Liverpool in 1864, Sebastian de Ferranti invented Britain's first major power station.

The company that still bears his name now makes chips for the BBC Micro and the Electron at its Chadderton factory.

BARRY WOOD'S TAILPIECE

TO go with their second processor, Acorn seem to have invented a new form of double speak.

Quoth an Acorn spokesman: "They're available from the warehouse now, but there may be some delay for new orders while we fulfil the backlog".

* * *

ACTUALLY, I really do believe there's a warehouse full of the things – they're probably hidden behind all those Electrons.

* * *

WHAT is certain is that because of the acute shortage of Electrons Acorn have had an "Out of Stock" notice printed for W.H. Smiths.

Good luck delivering those, lads ...

* * *

HAS anyone noticed that the QL in Sinclair's new machine stands for "quantum leap"?

Considering that a quantum leap is probably the smallest "leap" you can make, I think old Clive is being astonishingly honest.

* * *

"SO", quoth an inquisitive reporter to the ubiquitous and uniformative Acorn spokesman, "your new business machine will run Unix and Zenix, will it?"

"Who told you that?" cried the AS, aghast.

"You did", came the reply, "in your advert for a programmer last month".

* * *

WE had a phone call from an irate reader the other day. Apparently he'd seen an advert in the mag offering "Plinth for BBC Micro".

He was disgusted when he got a monitor stand and not a high-level language.

* * *

IN case you're wondering where I was last month, I was in Brazil, sipping coffee with Ronald Biggs.

And you'll never guess who I saw over there – but don't worry, Chris, your secret's safe with me ...

* * *

THE hyped-up press releases from software houses get worse and worse. One of the latest gems announces a "pending release".

I wonder if they'll let me buy it with my "pending money"?

* * *

LATER in the same release they tell us that "the decision was made to try and create a model program to cater for most all specifics".

Stirring stuff!

* * *

WELL I've got my micro and I've got my ashtray and all I need now is something to fill it.

Maybe I should take up smoking.

* * *

NEVER mind asking where all the Electrons have got to, I've got a much more interesting question.

What's happened to all the adverts for the Electron?

* * *

SO an Acorn spokesman denies that they might be dropping Econet. Very reassuring.

But would you buy a used Econet from an Acorn spokesman?

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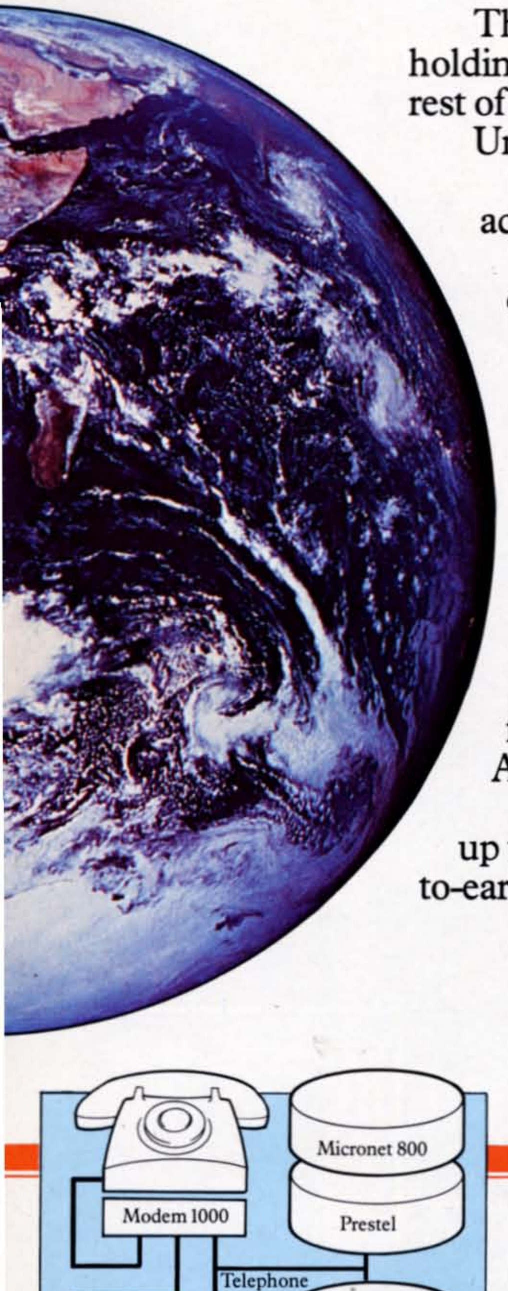

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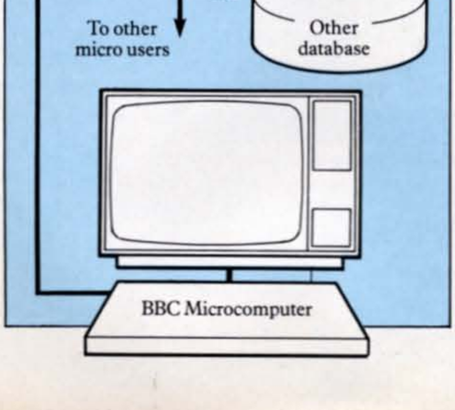

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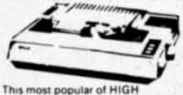

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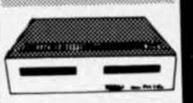

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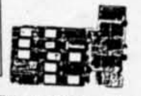

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Diamond Mine	5.70
Bannana Man	5.70
Guy In The Hat	5.70
3D Munchy	5.70

HARDWARE CORNER

ORDER A COMPLETE SYSTEM – GET ALL LEADS FREE

BBC	INC VAT
BBC Model B	199.00
BBC Model B	399.00
BBC Model B + Double density DOS	489.00
BBC Disc Upgrade	P.O.A.
BBC A-B Full Upgrade	95.00
BBC Teletext Receiver	225.00
BBC Z80 2nd Processor	T.B.A.
BBC 6502 2nd Processor	T.B.A.

DISC DRIVES	INC VAT
LVL Dual 10K	389.00
Pace Single 100K	169.95
Pace Single 40/80T D/Sided	349.95
Pace Dual 100K	389.00
Pace Dual 40/80T D/Sided	664.95
Torch Dual 400K Z80 Disc Pack	835.00
Pace 200K 40T D/Sided	270.00

MONITORS	INC VAT
Microvitec 14″ Colour	247.00
Sanyo 14″ Colour	269.00
Fidelity 14″ Colour Monitor	199.00
Grundig 14″ Colour TV/Monitor	309.00
Sanyo 12″ Green	89.00
Phoenix 12″ Hi-Res Amber	129.85

PRINTERS	INC VAT
Epson RX80	269.00
Epson RX80FT	299.00
Epson FX80	379.00
Epson FX100	569.00
Shinwa CP80	229.00
Riteman	286.00
Juki 6100 Daisywheel	449.00

MISCELLANEOUS	INC VAT
Sanyo DR101 Data Recorder	39.95
Cassette leads – all types	2.80
Acorn Joysticks	13.00
Quickshot Joystick (BBC)	19.95
Printer Cable (Parallel) 1.2 m	9.95
BBC Deluxe Cover	5.95
Light Pen	28.75
Data Cassettes 5 × C20/C15	1.95
The Plug Power Filter	14.95

Watford Electronics

Dept. BBC, CARDIFF ROAD, WATFORD, HERTS. ENGLAND.
Tel: Watford (0923) 40588/37774 Telex: 8956095 WAELEC

BBC MICROCOMPUTER

Model A—£260; Model B—£346

Upgrade your Model A with our Upgrade Kits and save yourself £ s s s

● BBC1 16K Memory (8 x 4816AP-3 100nS)	**£24.00**
● BBC2 Printer User I/O Port	**£8.10**
● BBC3 Disc Interface Kit	**£95.00**
● BBC4 Analogue I/O Kit	**£8.25**
● BBC6 Expansion Bus Kit	**£7.75**
● Complete Mod. Á to B Upgrade Kit	

Dust Cover for BBC Micro

Protects your expensive Micro from foreign bodies. **£3.95**

SEIKOSHA GP100A

10" Tractor Feed, 80 columns, 50CPS. Normal & Double width Char, Dot res graphics. Parallel Interface standard.
SPECIAL OFFER Only: **£144**

INTERFACE CABLE

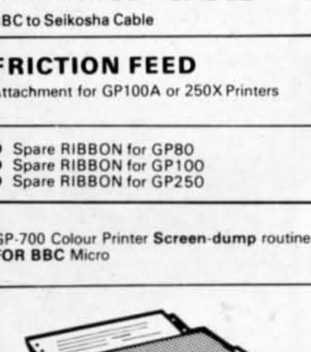
BBC to Seikosha Cable **£8.00**

FRICTION FEED

Attachment for GP100A or 250X Printers **£28**

● Spare RIBBON for GP80	**£4.50**
● Spare RIBBON for GP100	**£4.95**
● Spare RIBBON for GP250	**£5.95**

GP-700 Colour Printer **Screen-dump** routine in **ROM FOR BBC** Micro £12



Epson RX80

100 CPS, 9 x 9 matrix, dot addressable graphics, condensed and double width printing. Normal, Italic and Elite Graphics. Tractor feed, 10" max width, bi-directional, logic seeking. Centronics Interface standard.

ONLY **£235** (£7 carr.)

RX80 F/T PRINTER

As above but has both Friction and Tractor Feed. £259 (£7 carr. Securicor)

PRINTER INTERFACE BUFFER

Neatly packaged self contained box, supplied complete with all leads, manual and detachable power supply.

Price: 16K Unit	**£99**
Price: 48K Unit	**£135**

Epson FX80 Printer

160 CPS, 11 x 9 matrix, proportional spacing, superscripts, subscripts, dot addressable graphics. Normal, Italic and Elite characters. Up to 256 user definable characters. Down loadable character set. Condensed and double width printing. Full proportional spacing. Four user defined margin positions. Tractor and Friction feed. 10" maximum width Bi-directional, logic seeking Centronics interface standard.

ONLY **£345** (£7 carr.)

Epson FX100 Printer

Same as FX80 but has a 15" wide Carriage **£495**

Type	Ribbons	Dust Covers
MX80FT	£4.75	£4.50
MX100	£10.00	£5.25
FX80	£4.75	£4.95
RX80	£4.75	£4.50
GP80	£4.50	–
GP100	£4.95	£3.95
GP250	£5.95	£3.95
GP700	£18.50	–

RX & FX PRINTER INTERFACES

RS232	**£35**	RS232 + 2K Buffer	**£59**
IEEE 488	**£65**	2K Parallel	**£58**

BROTHER HR-15

DAISY-WHEEL PRINTER

An exceptionally high quality daisy wheel printer at the price of a dot matrix printer. 18CPS; bi-directional, 3K of buffer; has clear buffer facility, carriage skip movement, proportional spacing; underlining; bold print and shadow print. Prints in two colours; super and subscript facility. Impact control facility to vary pressure on paper for making carbon copies. Has Centronics parallel or RS-232 interface. Connects directly to BBC Micro. A ribbon cassette plus a separate red ribbon. Optional extras: single sheet feeder takes up to 150 A4 sheets; a keyboard that transforms HR15 into a sophisticated electronics typewriter. Attractively finished in beige.

ONLY **£349**

Single Sheet Feeder	**£199**
Keyboard	**£150**

Ribbon **£3;** Daisy Wheel **£18**

LISTING PAPER (Plain)

1,000 Sheets 9½" Fanfold Paper	**£7**
1,000 Sheets 15" Fanfold Paper	**£9**
Teleprinter Roll (Econo paper)	**£4**

PRINTER LABELS (continuous stationery)

1,000 90 x 36mm	**£5.50**
1,000 90 x 49mm	**£7.75**
1,000 102 x 36mm	**£6.25**

Carriage on Printer Paper & Labels £1.50

PRINTER LEAD 36"

Ready made printer lead to interface BBC Micro to EPSON, SEIKOSHA, NEC, STAR, JUKI, BROTHER, SHINWA, etc., Printers.

ONLY £8

Special Extra long 6 foot Cable **£12**

BBC Micro WORD-PROCESSING PACKAGE

A complete word processing package consisting of: BBC Model B, Zenith 12" Green or Amber Monitor, Twin 200K highly reliable (1 year warranty) Teac Disc Drives in matching beige colour, the popular WORDWISE word processor, Watford's own highly sophisticated 62 File DFS interface fitted, the world renowned Brother HR15 Daisy Wheel Printer, Gemini's Beebplot & Beebcalc Spreadsheet Analysis Software discs, 10 blank diskettes, 500 sheets of fan-fold paper. Manuals and all the leads. To enable you to carry your Micro around, we shall pack it in our Antique Brown leatherette Attache carrying case.

ONLY **£1,275** (carr. £15)

(P.S. We will alter the package to suit your requirement. Call in for a demonstration).

5¼" DISKETTES

(Lifetime warranty)

● 10 Verbatim or 3M Diskettes S/S D/D	**£17**
● 10 Verbatim or 3M Diskettes D/S D/D	**£27**

DISC ALBUMS

Attractively finished in beige leatherlook vinyl. Stores, protects and displays 20 discs in double-sided clear view pockets. ONLY **£4.95**

PLASTIC LIBRARY CASES for Disc Storage

5¼" (holds 10) **£2**

LOCKABLE STORAGE UNITS

Attractively finished, strong beige plastic base fitted with dividers. Smoke acrylic top. Supplied with adhesive title strips for ease of filing.

● M-35 Holds upton 35 mini discs	**£16**
● M-85 Holds upto 85 mini discs	**£20**

FLOPPY HEAD CLEANERS

Unless your office/home is dust free, you should clean heads at least once a week to avoid the risk of cross contamination.

Simply apply the cleaner to one of the specially formulated cleaning discs, insert into the drive and initialise. If your system has no initialisation program then insert the disc and open and close the door 5 times.

£16.00

AMS 3" DISC DRIVES

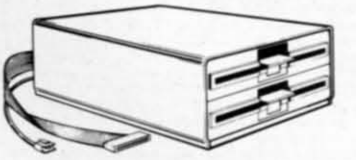
These popular mini disc drives, now available from WATFORD. For details see AMS advert in this magazine. Supplied complete with cables, manual and utilities disc.

Single 100K per side	**£163**
Twin 200K per side	**£320**

DISC DRIVES CASED WITH CABLES (less PSU)

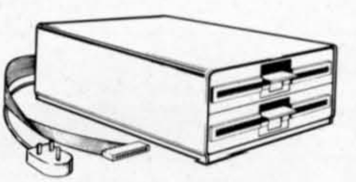
(All Drives are NEW SLIM-LINE Type)

NEW LOW PRICES



- **CLS 100** Single, TEC Single sided 40 track 100K, 5¼" Disc Drive **£129**
- **CLS400** Single, Mitsubishi Double sided 80 track 400K, 5¼" Disc Drive **£188**
- **CLS400S** Single, Mitsubishi Double sided 40/80 track Switchable, 400K, 5¼" Disc Drive **£215**
- **CLD200** TEC Single sided 40 track 200K, twin 5¼" Drives **£252**
- **CLD800** Mitsubishi Double sided 80 track 800K, 5¼" TWIN Drives **£365**
- **CLD800S** Mitsubishi Double sided 40/80 track switchable, 800K, Drives **£399**

(CUMANA) DRIVES CASED WITH PSU & CABLES



- **CS100** TEC Single sided 40 track 100K 5¼" Single Disc Drive **£145**
- **CS200** TEC Single sided 80 track 200K 5¼" Single Disc Drive **£210**
- **CS400** Mitsubishi Double sided 80 track 400K 5¼" Single Drive **£259**
- **CS400S** Mitsubishi Double sided 40/80 track 400K 5¼" Single Drive **£340**
- CD200 TEC Single sided 40 track 200K 5¼" TWIN Disc Drives **£275**
- **CD400** TEC Single sided 40 track 200K 5¼" TWIN Disc Drives **£365**
- **CD800** Mitsubishi Double sided 80 track 800K 5¼" TWIN Drives **£425**
- **CD800S** Mitsubishi Double sided 40/80 track Switchable 800K TWIN Drives **£465**
- SPARE DRIVE CABLES, SINGLE **£6;** DUAL **£9**
- DFS Manual (comprehensive) **£7.50** (No VAT)

P.S.

1. You do not require Formatting Discs when using our DFS as the formatting program is in the ROM, nor do you require the expensive 40/80 track switchable drives as with our DFS, you can read and write 40 and 80 track discs on an 80 track drive (software switchable).

2. MITSUBISHI SLIMLINE DISC DRIVES that we supply are Double Sided, Double Density 5¼", 1 Megabyte. (With BBC Micro 400K after formatting.) When used in conjunction with Double Density board one obtains 800K (approx) after formatting. Track density 96 TPI, track to track access time 3mSec. These drives are very fast, quiet and efficient. We strongly recommend them.

NEW Mk II 13 ROM SOCKET BOARD

Now all lines fully buffered – On board battery back-up facility – will now accept EPROMS 2716, 2732, 2764 & 27128 and ROMs 6116 & 6264.

Simply plugs into one of the four ROM sockets currently available in BBC Micro. There are only 5 solder connections to be made. Full instructions are supplied. This board has been ergonomically designed to enable the user, easy further expansion inside the Micro, e.g. Double Density Board, Torch Board, etc. (At Watford, we think ahead.)

Our 13 ROM SOCKETS BOARD enables the User to increase the Sideways ROM capacity the basic four sockets on the main board upto the full SIXTEEN capable of being supported by current operating systems. In addition the board is designed with the facility to hold upto 16K RAM, which when switched into operation is automatically selected by any WRITE signal to the Sideways ROM area. This gives the User the ability to write a utility or language and upon pressing break have the utility or language up and running (new ROM software can be developed and tested in situ.)

The Board gives the User, plenty of freedom to explore the possibilities of the new paged ROMs due in the coming months and offers them the chance to develop their own.

All lines are fully buffered and the Board meets or exceeds all timings for operation in the BBC Microcomputer. When fully populated, the ROM Board consumes less than half the recommended maximum current limit.

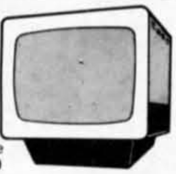
Supplied ready-built and tested complete with fitting instructions.

ONLY £32.50 (carr. £1)

EPROMs & CMOS RAMs for BBC MICRO

2764-250nS (8K ROM)	**£6.95**
27128-250nS (16K ROM)	**£19.00**
6116-150nS (2K RAM)	**£6.00**
6264-150nS (8K RAM)	**£38.00**

MONITORS



MICROVITEC 1431
14" Colour Monitor, RGB Input. (as used in BBC programmes) FREE Interface Lead. **Special Offer £189**

- **MICROVITEC 1451** Hi-res 14" Monitor incl. lead **£319**
- **NEW MICROVITEC 14"** Colour Monitor/Composite Video **£249**
- **KAGA RGB** 12" Medium Resolution Colour **£199**
- **KAGA RGB** 12" High Resolution Colour **£259**
- **KAGA** 12" Standard resolution colour MONITOR/COMPOSITE VIDEO **ONLY £205**
- **BNC** Connecting Lead **£3**
- **RGB** Connecting Lead **£5**
- **ZENITH 12"** Green or Amber Monitor Hi-resolution **£75**

Carriage on Monitors £7 (Securicor)

READY-MADE LEADS

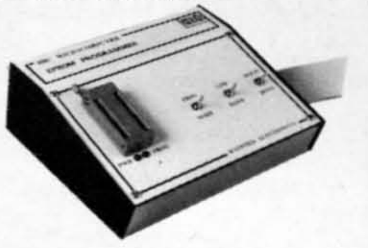
CASSETTE LEADS 7 pin DIN Plug to 5 pin DIN Plug + 1 Jack Plug	**£2.00**
to 3 pin DIN Plug + 1 Jack Plug	**£2.00**
to 7 pin DIN Plug	**£2.50**
to 3 Jack Plugs	**£2.00**
6 pin DIN to 6 pin DIN Plug (RGB)	**£2.50**
Monitor Lead, BNC to PHONO	**£3.00**

Disc Drive to BBC Micro Power Lead Single: **£3.00** Dual **£3.75**

MISCELLANEOUS CONNECTORS

	Plugs	**Sockets**
RGB (6 PIN DIN)	**30p**	**45p**
RS423 (5 pin Domino)	**40p**	**50p**
Cassette (7 pin DIN)	**25p**	**65p**
ECONET (5 pin DIN)	**20p**	**30p**
Paddles) 15 pin 'D')	**110p**	**215p**
BBC Power Plug 6 way	**75p**	–
Disc Drive Plug 4 way	**70p**	–

EPROM PROGRAMMER for BBC MICRO



At last! – the EPROM Programmer for BBC Micro Computer from WATFORD ELECTRONICS that will suit both your pocket and all your requirements. Programs all popular types of EPROMS from 2K bytes up to 16K bytes – **2716 — 2516 — 2532 — 2564 — 2764 — 27128.**

This extremely powerful system is designed for your needs of TODAY & TOMORROW! – BBC Basic programs can be copied into EPROM and subsequently re-loaded faster than from a disc! Suitable for both hobbyist and professional users!

Just look at these features:

- **COMPLETELY SELF CONTAINED –** Housed in its own sturdy case – Uses its own power supply – connects directly to the 1MHz Bus – Simple and Safe!
- **FULL SOFTWARE SUPPORT** – Comes complete with simple to use fully machine code ROM based software and easy to understand manual. Facilities include Varification, Reading, Virgin Testing, Writing, Editing, Saving, Loading and more! NOTE!! – This software does not simply comprise hastily prepared routines to get you going, but is a professional, purpose designed applications package.
- **ACORN BUS COMPATIBLE** – Use of the 1MHz connection complies with all Acorn addressing recommendations – That means you can still add-on such things as the TELETEXT, IEEE 488 TUBE and PRESTEL
- Allows more than one program to reside in an EPROM using the ROM Filing System.

ONLY **£89** incl. Manual (£3 carr)

BEEB SPEECH SYNTHESISER

VERSATILE SPEECH SYNTHESISER UNIT FOR THE BBC MICROCOMPUTER

Watford Electronic's very own Speech System. Specially designed so that even a novice can make his BBC talk:-

SIMPLY the best! – An unlimited speech synthesis system. Complete with easy-to-follow manual. Controlling software is in ROM so no Cassette Loading problems!

PHONEMES for word synthesis – That means unlimited vocabulary! No extra speech dictionary chips to buy!

BUILT-in Library of approximately 500 words to get you started.

ENGLISH accent – Utilises inflexion techniques to produce highly comprehensible speech.

EASY to use system – Just plug the software ROM into a socket, the Speech unit into the User Port, and away you go! No specialised 'dealer upgrade' required!

COMPACT unit – The whole system is built into a small case – easily tucked behind the computer. Auxillary output socket provided for direct connection to an external amplifier.

HOURS of fun! – Suitable for any application – Games, Educational Programs, Specialised Packages.

We know this all seems to good to be true but DON'T BE LEFT SPEECHLESS! Order your Versatile Speech Unit now!

Only £44

Continued →

THE ULTIMATE DFS FOR BBC MICRO

by Watford Electronics

Highly acclaimed at The ACORN and BBC MICRO USER Shows. What do the independent press say?

Good value for money – *Beebug Aug. '83*
A very worthwhile package – *The Micro User*
You'll be buying a very powerful package – *Personal Computer News*
Superior DFS; Excellent disc sector editor – *Computer Answers*

Without a doubt, the most sophisticated DFS Software yet written for BBC Micro Computer. This powerful new DFS is fully compatible with ACORN DFS yet has much increased power due to additions, carefully designed to make life easier in normal use. It consists of over 14K of efficiently written machine code. It is entirely self contained and so does not require a utilities disc to function.

- The system can either use the ACORN standard 31 files per disc side or DOUBLE THE CAPACITY to 62 files. The size is selected at formatting time. Copying between discs with different catalogue sizes works perfectly normally.

- A FORMATTING PROGRAM is built in, permitting formatting to 35,40,80 track formats with either 31 or 62 files. Since the formatter is built in to the DFS it can be used without affecting whatever program you are using.

- A DISC VERIFIER is also built in. This checks the internal checksums on each sector to identify any corrupted data. This is extremely useful when saving valuable data as it shows faulty discs quickly and easily. Again it does not affect the program you are using.

- A built in DISC SECTOR EDITOR gives a screen window onto the disc enabling detailed editing of any byte on the disc. This is very useful for recovering accidently deleted files and can save weeks of work.

- A double step mode allows the User of 80 TRACK DRIVES TO READ & WRITE BOTH 40 and 80 TRACK DISCS. This mode is software selected for each drive individually, thus enabling a 40 track disc to be copied on to an 80 track very easily. THIS ELIMINATES THE NEED FOR EXPENSIVE 40/80 TRACK SWITCHABLE DRIVES.

- A WORKFILE function sets the name to be used when the null filename is issued. This allows a program to be edited and repeatedly saved having only typed its name once.

- When using LOAD, CHAIN, etc. it is possible to specify an ambiguous filename. This will result in the first file whose name matches the specification being used. This saves typing the end of a filename that you know is uniquely identified by its first few characters.

- Two commands exist to simplify the transfer of programs from TAPE TO DISC. These load the file to &1100, switch off the disc system and then move the file to its correct load address; thus saving a lot of complicated programming. This command can be used to load files up to 27K75 long.

- An advanced COPY command is included which will prompt the user, requesting whether to copy each file.

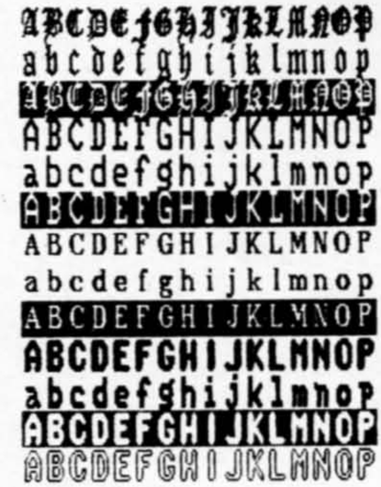
- RENAME has been extended to allow the use of ambiguous filenames. This allows you to change BERT1, BERT2, BERT3 to FRED1, FRED2, FRED3 with only one command.

- OPENOUT has been improved to give you fewer annoying 'Can't extend' errors, as it automatically picks the biggest space on the disc in which to put a file. A SPACE command lets you know how much space *COMPACT could create before you waste time doing it.

Continued:

BEEBFONT ROM

BEEBFONT is a remarkable new concept in BBC software, exclusively available from Watford. Once fitted, the 16K ROM will enable you to produce attractive text displays in following different styles:



★ **It works in modes 0, 1, 2, 4, using full colour.**
★ Simply use Ctrl–V to select the font and all further screen output will be in a new style.
★ Even the ordinary Beeb character set can be enhanced by doubling height or width and emphasising to give bold print.
★ A comprehensive editor is included which enables the user to design his own characters.
★ A spooling program is provided, which enables pre-formatted text files to be displayed on an EPSON FX, RX, and NEC Printers, using the full range of character styles. (Please specify printer type when ordering.)
★ This really must be one of the most original and exciting products of the year.
★ A twenty page manual is provided and the demo/editor software comes on disc or cassette (please specify when ordering). **ONLY £39**

DFS continued:

- 2K of RAM can be reclaimed from the DFS by setting "PAGE" to & 1100.

Now with extra features:

- The powerful library system has been extended so that libraries now work on all accesses not only *RUN. This allows you to have a utility directory with all your commonly used programs without muddling in your current workfiles. Very useful for BCPL User.

- Programs can now reside lower in memory by reclaiming some of the DFS' workspaces, indeed PAGE can be taken as low as £1100 under most circumstances.

- To make DFS easy to use, wild cards ("*") have been made vastly powerful, e.g. *INFO

A gives information on all files in the current directory which have an "A" anywhere at all in their filename.

- Comprehensive and clearly written Manual (available separately) gives the user a complete package deal.

- Fully compatible with BBC TELETEX and TORCH Systems

DFS ROM ONLY **£29**
Complete Disc Interface Kit including DFS ROM and fitting instructions ONLY £95
Comprehensive and clearly written DFS Manual. **£7.50 (No VAT)**
P.S. We will exchange your existing ACORN DFS or PACE (AMCOM) DFS for the highly sophisticated Watford's DFS ROM for **ONLY £25**
Watford's DFS is exclusively available from Watford Electronics. We DO NOT retail through any Dealers.

BEEBMON

Watford's own Machine code Monitor ROM written by Andrew Bray (Cambridge), co-author of the BBC Micro Advance User Guide.

The most powerful and versatile machine code monitor ROM yet written for BBC Micro. It has all the normal memory editing, moving and relocating facilities, plus all editing is with a full screen editor allowing scrolling up and down memory, entering in Hex, ASCII or standard assembler mnemonics.
In use as a debugging tool, you run code under a total emulation system. Everfelt a desperate urge to set a break point in ROM? No problem – you can even have breakpoint on reading or writing locations in memory and on register contents. The system fully supports debugging of sideways ROMs e.g. BASIC can fully and easily be run from within Beebmon and from there DFS and other sideways ROMs can be used in total emulation mode.
Beebmon can even run itself. In so doing you can nest Beebmon up to a level limited only by the memory size. Beebmon uses 256 bytes of workspace, located anywhere in memory, even on the 1MHz Bus. Beebmon effectively uses no zero page workspace, so your program (e.g. BASIC) can use any or all of the base page. How does it achieve this? By providing a 6502 interpreter all programs running under it exist in a vertual BBC, so special memory locations like the ROM latch are not actually accessed by your programs, instead they alter a location in Beebmon's workspace. Emulation also allows immediate return to Beebmon command level by ctrl-escape no matter what code is being excuted at the time. All this exceptional power and flexibility is complemented by a clear and detailed manual included in a value for money price of:

***SPECIAL OFFER THIS MONTH* £19**

DISC DOCTOR **£26**

A sophisticated Disc Utility ROM with many useful commands. (For detail description please refer to Computer Concept's advert in this magazine.)

Wordwise

Without doubt a very sophisticated piece of software for the BBC Micro. It has all the features of a professional word processor yet is easy to use.

SPECIAL OFFER THIS MONTH: **£32**

Computer Concept's

Graphics ROM **£27**

DISASSEMBLER ROM

Discover the hidden secrets of BASIC and the OPERATING SYSTEM with this easy to use programmers tool.
A ROM based machine code Disassembler for the BBC micro. It enables machine code programs to be listed in BASIC/DUMP format and thus is the perfect complement to the built in assembler. It allows Sideways ROMs, files on disk or tape to be listed, and also has a comprehensive editor, allowing mnemonics to be altered directly, as well as HEX, DECIMAL, ASCII and BINARY memory editing. There is also a full set of labelling facilities available (up to 3,200 labels), with the major locations and routines already labelled.
Thus DIS-ASM enables any monitor program, such as BEEBMON to be used to much greater effect as it is not necessary to disassemble memory each time the display is altered.
All these and other facilities for ONLY **£16**
(Price includes a comprehensive manual and fitting instructions.)

ACCESS ORDERS BY TELEPHONE
Simply phone your order through. We do the rest
(0923) 50234/40588

WATFORD'S BEEB PRINTER ROM

"Makes Printing Childs Play"

Are you fed up with not being able to unravel your printer manual and use all those features you paid for? Need sensible paging for use in the creation of booklets? Then you certainly need our Beeb Printer ROM.

A machine code printer utility in ROM.

- 'Single' key operations replace control code sequences for underline, font and size selection, paper movement, etc. Up to 30 come pre-defined, without effecting normal fn key usage.
- **This rom allows easy control of your printer from 'Within' WORDWISE text. Instead of long escape sequences, you just 'OC' a single number to Select, Underline, Print Styles, etc.**
- Automatic fanfold page margins. Puts gaps in listings. PRINTed text etc to skip the folds. The gap size alternates to minimise paper wastage when using binders.
- Form feed and related commands, made available on ALL printers. Can also provide a left margin.
- User defined characters embedded within text are printed as on VDU.
- ★Commands select option for GP100, STAR, NEC, MX/FX, LP VII/DMP100, DMP200. Operates with Parallel and Serial Printers.
- Fully functional with the popular WORDWISE wordprocessor.

Supplied complete with a comprehensive 50 page manual.

Price: £24

(When ordering, please specify the make of printer you have.)

SPECIAL OFFER

Buy BEEB PRINTER ROM and any one of the two SCREEN DUMP ROMS for

ONLY: £33 (A saving of £7+)

TWO NEW GRAPHICS SCREEN DUMP ROMS

DUMP OUT 2

A versatile machine code hi-res Screen Dump ROM.

- You can now have small or large 2 tone dumps and multi-tone 'colour' pattern dumps (8 distinct mode 2 shades) on every printer.
- *Commands initiate the required dump optional parameters may be included for colour masking and selecting the part of the screen to be dumped.
- Clever use of the processor stack means that no workspace is required! (Multitone dumps also use 2 zero page locations.)
- For GP80/100/250, STAR, NEC, EPSON MX/RX/FX, LPVII, DMP100/120/200/400.
- Screen modes 0, 1, 2, 4, & 5.
- Instruction Manual

All this for ONLY **£15**

EPSON DUMP ROM

A specially designed Dump ROM for EPSON RX and FX Printers.

Will accurately DUMP all Screen modes including TELETEXT, GRAPHICS and DOUBLE HEIGHT. MULTITONE DUMPS are also supported. Simple single command (*SCDUMP) operation. **Only: £16**

WATFORD JOINS THE COMMUNICATION REVOLUTION

MODEM 84

P
P R E
P R E S T
P R E S T E L
E S T E L
T E L
L

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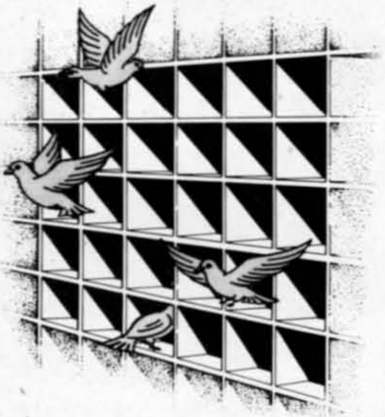

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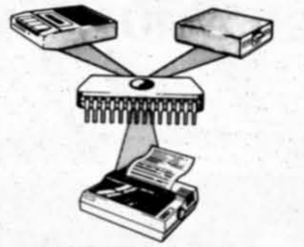

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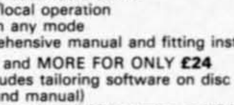

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Part 13 of MIKE BIBBY'S introduction to programming

Take a PROC and let your micro do all the toiling

STRAIGHT to work again this month – have a look at Program I. It may seem a rather futile program to you, but it does make a point.

The idea is to present several pages of information on screen, one after another.

You move onto a new page by pressing a key.

```
   10 REM *** PROGRAM I ***
   20 MODE 6
   30 PRINT TAB(12,12)"This is page one."
   40 PRINT TAB(7,22)"Press any key to continue"
   50 dummy$=GET$
   60 CLS
   70 PRINT TAB(12,12)"This is page two."
   80 PRINT TAB(7,22)"Press any key to continue"
   90 dummy$=GET$
  100 CLS
  110 PRINT TAB(11,12)"This is page three."
  120 PRINT TAB(7,22)"Press any key to continue"
  130 dummy$=GET$
  140 CLS
  150 END
```

Program I

Program I has three pages of information. Admittedly page one only has "This is page one" on it, and so on. But the idea's there.

You could, if you wished, have several lines of information PRINTed onto the screen for each page.

The program starts by setting mode (line 20), thus effectively clearing the screen. It then prints out the information for that page (line 30).

We use line 50 to wait for a key press. Remember, GET$ holds things up until a key is pressed. The actual key pressed is stored as *dummy$* but we aren't too interested in its value, hence the name. It just holds things up (leave it out if you don't believe me).

Notice line 40. This is only common politeness – we're telling the user what to do to continue. If we didn't put this line in before the GET$ how is he or she to know what to do?

Incidentally, it's telling a bit of a white lie: It's not 'any key', Escape or Break will cause problems!

Once we've pressed a key, line 60 clears the screen, line 70 prints out "This is page two" and then we're back into polite waiting with lines 80 and 90.

Another key press takes us through to page three. Then the final key press takes us through to the end of the program at line 150.

Notice the end of line 150. When the micro encounters an END statement it just comes to a halt.

Actually, you don't need this in the program. The micro assumes, reasonably enough, that when you run out of lines you want to END. Try leaving 150 out to prove it!

There's another way of stopping a program – with the command STOP. Try Program I with the line:

```
150 STOP
```

Did you notice anything different?

With STOP the micro tells you the line number you've finished at.

This can be useful when you've lost track of where a program's going – which, unfortunately, is easier than you might think. Sprinkle in a few STOPs and one of them's bound to come up with the line number you're at.

To return to Program I. If you look carefully, you'll notice that lines 40 and 50 are identical to lines 80 and 90 and lines 120 and 130. In other words, we're repeating ourselves.

A microcomputer is extremely good at repeating things. One of the first rules of programming is: *"Don't repeat lines of code, let the micro do it for you".*

Often as not, this means putting things in a loop. In this case, though, we're going to do something different.

We're going to write out the repeated lines once only – assigning a name to them in a similar manner to the way we labelled variables.

Each time we want the computer to use those lines, we refer to them by their label.

As I've said, this is rather like labelling strings and numbers with variables. This time, however, we're labelling lines, so things are a bit different.

The set of lines we want to refer to is called a procedure.

Let's see how we can use a procedure to replace the repeated lines in Program I – these are the ones that say: "Press any key to continue" – and wait for a GET$.

Suppose we want to refer to these lines as key, we give them the name PROCkey. Notice:

- We have to have PROC first, in capitals. It's short for procedure.
- There's no space between PROC and the name we've given it.

So, we're going to refer to the lines as PROCkey.

However we must let the computer know what we mean by PROCkey. To put it more formally, we must define PROCkey.

To do this we 'bracket' the lines we want with:

```
DEF PROCkey
```

before them and:

```
ENDPROC
```

after them. DEF stands for define, of course.

From then on, the lines between the DEF and the ENDPROC are known as PROCkey.

Whenever the micro encounters PROCkey it will:

☐ Go to where the procedure is defined.

☐ Carry out the lines of code it finds there.

☐ On meeting ENDPROC it will return to the next part of the program directly after the PROCkey that 'called' it.

That is, whenever the micro meets a procedure it does that procedure exactly as defined. Then it carries on from where the main program was up to – it doesn't lose its place.

Notice that you can call a procedure, as we say, from several different places in a program. The micro always remembers where it's up to and goes back there.

```
   10 REM *** PROGRAM II ***
   20 MODE 6
   30 PRINT TAB(12,12)"This is page one."
   40 PROCkey
   50 CLS
   60 PRINT TAB(12,12)"This is page two."
   70 PROCkey
   80 CLS
   90 PRINT TAB(11,12)"This is page three."
  100 PROCkey
  110 CLS
  120 END
  130 DEF PROCkey
  140 PRINT TAB(7,22)"Press any key to continue"
  150 dummy$=GET$
  160 ENDPROC
```

Program II

To see how this works in practice, look at Program II. I've replaced the old repetition with three calls to PROCkey at lines 40, 70 and 100.

The procedure itself is defined in lines 130 to 160.

The program continues exactly as Program I until it meets line 40. Here PROCkey is called.

Remembering where it's got up to, the micro goes to where PROCkey is defined, then does lines 140 and 150 – the key press bit.

It then hits ENDPROC and goes back to the main program, continuing with line 50, then 60, until once more it calls PROCkey with line 70.

Again the micro does 140 and 150 then hits ENDPROC. However it's 'marked its place' in the program, so this time when it goes back it resumes at line 80.

I think you can work out for yourself what happens at line 100.

The program finally ends at line 120.

That END statement in line 120 is important. Leave it out and see what happens. The program runs normally until you press a key after page three.

Then, instead of finishing like last time, you get another "Press any key to continue". If you take it up on the offer all you get is:

```
No PROC at line 160
```

What's going on?

Well, everything has worked perfectly up to and including line 100 which calls PROCkey. When you return from the procedure line 110 clears the screen.

But, whereas line 120 would have ENDed things there if you hadn't left it out, the micro crashes on through lines 130 and 140 to line 150.

It then waits for you to press a key. Notice that you've "gate-crashed" the procedure this time. You didn't call it with PROCkey.

This means that when you do press the key, and the micro encounters the ENDPROC of line 160, it hasn't got any place marked in the program to go back to.

This is what is meant by the plaintive message:

```
No PROC at line 160
```

So to stop yourself inadvertently entering procedures in this way, use END at the end of your main program.

Now take a look at Program III:

```
10 REM *** PROGRAM III ***
20 MODE 6
30 asterisk$=""
40 position%=10
50 FOR loop%=1 TO 5
60 asterisk$=asterisk$+"*"
70 PRINT TAB(0,position%+loop%)
asterisk$
80 NEXT loop%
```

Program III

This simply prints out a triangle of asterisks. *position%* determines how far down the screen the triangle appears.

To see this, try altering the value in line 40. For example:

```
40 position%=5
```

I don't think you should have much trouble following that piece of code.

```
10 REM *** PROGRAM IV ***
20 MODE 6
30 position%=0
40 PROCtriangle
50 position%=5
60 PROCtriangle
70 position%=10
80 PROCtriangle
90 position%=15
100 PROCtriangle
110 END
120 DEF PROCtriangle
130 asterisk$=""
140 FOR loop%=1 TO 5
150 asterisk$=asterisk$+"*"
160 PRINT TAB(0,position%+loop%)
asterisk$
170 NEXT loop%
180 ENDPROC
```

Program IV

In Program IV I've incorporated the triangle drawing code from Program III into a procedure called PROCtriangle. If you compare the two programs it should be obvious.

The point is, having done it that way, I can call the procedure several times with different values for *position%* – thus printing the triangle in different positions on the screen.

Lines 30 and 40 print the triangle at the top of the screen by setting *position%*=0 (line 30) and then calling PROCtriangle (line 40).

Lines 50 and 60 then print a triangle further down the screen by setting *position%*=5 (line 50) and then calling PROCtriangle (line 60).

You should be able to see how we get the other two triangles on the screen.

We can make things neater still – look at Program V.

```
10 REM *** PROGRAM V ***
20 MODE 6
30 PROCtriangle(0)
40 PROCtriangle(5)
50 PROCtriangle(10)
60 PROCtriangle(15)
70 END
80 REM ========================
90 DEF PROCtriangle(position%)
100 asterisk$=""
110 FOR loop%=1 TO 5
120 asterisk$=asterisk$+"*"
130 PRINT TAB(0,position%+loop%)
asterisk$
140 NEXT loop%
150 ENDPROC
```

Program V

Line 30 reads:

```
30 PROCtriangle(0)
```

This replaces the pair:

```
30 position%=0
40 PROCtriangle
```

in Program IV.

What we're doing here is to use the brackets after PROCtriangle to hold a value we want the procedure to use. In this case it's 0, the position we want the triangle to be printed at.

If you look at line 90, where the procedure is defined, you'll see that we have *position%* in brackets after the procedure name. That is:

```
90 DEF PROCtriangle(position%)
```

The *position%* is there to 'catch' the value we put inside the brackets when we call the procedure.

In other words, if in the program we use:

```
PROCtriangle(0)
```

to call the procedure, then when the micro enters that procedure *position%* is given the value 0 and used as such throughout the procedure.

On encountering ENDPROC is goes back to its former place in the main program.

If we now call the same procedure with:

```
PROCtriangle(5)
```

when the micro enters the procedure *position%* is set to 5 – so the triangle gets printed in a different position.

By handling the value to the variable contained in brackets in the procedure definition we've been able to eliminate all the *position%*=0 and so on that we had in the Program IV.

We call transferring values to procedures via brackets "passing parameters to the procedure".

As we'll see next month, it can come in very useful.

All disc software now available on 3" disc – add £3.00 to printed prices.

BBC MICRO COMES OF AGE..

β-BASE: £25.00

β-BASE is a very powerful and very flexible database program. Because β-BASE is designed specifically for disks there are none of the limitations found in most database programs, which are usually upgraded cassette programs. β-BASE is not limited by memory and even the disk limit can be overcome easily to provide an unlimited file size. Take a look at the features listed below and compare it with so called professional programs at up to £400, we think that you will be amazed. Why limit yourself to a 16K eprom – B-base contains approx. 30K of tightly compacted code.

Maximum File Size (40 track) - 99k & (80 track) - 199k.
Maximum Record Size - 2k: Maximum Number of Fields - 200:
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4) SEARCH - multiple function search on up to 5 fields.
5) OPTIONS:
   a) sort records found in search on 3 fields in ascending/descending order + set number of chrs to sort on (max records sorted is 500).
   b) work search list, with edit and delete.
   c) save records found in search to disc.
   d) load previously saved search for re-search etc.
   e) make a search list.
6) PRINTER - copes with parallel and serial printers and allows you to set up the printout + all printer codes allowed + allows you to join fields together and allows you to set them into columns etc. A label print routine allows single or double labels to be printed.
7) REDEFINE - allows you to transfer all records from old file to new file plus add or amend field or record size. No more re-entering all your data if you wish to add a field.
8) TRANSFER - allows you to transfer selected records between files.
9) NEW - allows you to define new file.

+ real time clock + many more features.

If you want a professional database for the BBC micro the β-BASE is your only option.

Not compatible with Amcom DFS.

REPLICA II: £12.00

This is the one that everybody has been waiting for. The original REPLICA set a very high standard and many said that it could not be improved. The specification that we set our chief programmer included some supposedly 'impossible' features. In fact ACORN state that some of the things that we have done are impossible, it just took us a little longer that's all. REPLICA II will transfer most of your cassette based programs to disk, even more than REPLICA did. Now when you buy disk drives you do not have to throw away your expensive cassette based programs. REPLICA II will transfer 'LOCKED' programs, programs loading as files, programs that load below &E00, those with up to 6 sections and those up to &6E in length eg adventure programs. No more waiting for 6 minutes whilst your adventure programs load. REPLICA II is very easy to use and the user just enters a name, how many sections and whether CHAIN, *RUN or *LOAD is used to load the first section. Press play and let the program do the rest, even a menu. You cannot afford not to have a REPLICA II, think how much it will cost you to buy just 1 disk version of your favourite program – it is probably more than REPLICA II which will hold up to 16 programs, limited only by the disk capacity.

BEEBSYNTH: disk £11.00 cassette £8.00

A very powerful yet easy to use sound generating program that can be used by expert and novice alike. Up to 16 envelopes can be defined and saved. The envelope definer is very easy to use, control is through the cursor keys, and the effects of your changes can be heard immediately. When you have defined your envelopes press 'K' for Keyboard and the keyboard is transformed into a musical instrument, but you control which instrument. Lets you play chords, not just single notes, change pitch and duration etc etc. A superb program that you can use immediately. Unlimited sounds at your disposal. Recommended by MICRO USER, PCN, HCW etc.

THE KEY: £12.95

A disk utility program that provides the user with the tools to explore the disk environment and use it to its best advantage. The programs are:

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5)	RETRIEVE	- Allows the user to recover data or programs that have been accidentally erased or damaged by a head crash.

Every disk owner should have one, you will wonder how you ever managed without it. Recommended by WHICH MICRO, EDUCATIONAL COMPUTING etc. 'THE KEY' has been imitated by many but bettered by none.

available at larger Boots

JOYSTICK UTILITY: £6.00

Converts non joystick programs to work with joysticks. Works with any program using INKEY (-) in Basic or machine code, to detect movement, which applies to most programs. The routine is relocatable and sensitivity of the joystick can be varied. Compatible with most games, including Acornsoft. Very easy to use, just press the keys you want to transfer. The machine code can be saved as a block of just 100 bytes. Supplied on cassette but can be transferred to disk.

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SHADOW: £8.00

SHADOW is a tape cloning program that will enable you to make security copies of your own valuable cassette software. SHADOW works with 99% of all known programs including those with sections at 300 BAUD and those that load as files. SHADOW will handle programs with any number of sections and it will work with any of the current operating systems including 0.1, 1.0, & 1.2. SHADOW is the definitive tape backup system and as a bonus you also get 'INSPECTOR' on the same tape. This allows you to view all areas of memory, search and alter bytes, etc. Colour coding helps to simplify memory usage. All this for just £8.00, I don't know how we do it. 'It is a condition of sale that this program is not used for piracy".

GRAFKEY/GRAFDISK disk £12.95 cassette £9.00

The 'GRAF' series of programs are, to our knowledge, the cheapest entry to the CAD (Computer Aided Design) field on the BBC micro. Input is by either joystick or keyboard. All graphics modes can be used and altered whilst running, the functions provided are: Line, rectangle, triangle, circle, text (upper and lower case), paint and colour pallet (8 colours and flashing). Drawing aids include: Alignment grid, circle copy, delete, free memory, purge memory, variable cursor speed, clear screen and redraw. Save drawings to tape in about 20 seconds or to disk in about 2 seconds. Rubber Band is a very flexible line drawing facility and has to be seen to be believed. Pictures can be saved and included in your own programs, very easily. GRAFDISK also provides a screen save facility. Recommended by BBC MICRO USER, PCN, ELECTRONICS & COMPUTING, LASERBUG ect, used by universities, colleges and business, as well as the enthusiast.

SINGLE KEY: (requires 1.2 O.S.) £5.00

SINGLE KEY ENTRY provides the user with single key entry of all 66 keyworks on the BBC micro. Speeds up your program input, it's just like having 66 function keys and it only occupies 256 bytes. Compatible with BASIC 1 & BASIC 2.

EDUCATIONAL PROGRAMS

THE GARDEN: £8.00

A series of three programs to help children with colours, spelling and recognition. The three programs cover three overlapping age ranges from bright four year olds to eleven year olds. The first level concentrates on colours and requires a simple Y/N answer to a question. The other two levels are orientated towards spelling and sentence structure. A sentence is presented with a missing word and the child is required to choose the correct word from a list and then type it in. Using this method each exercise involves a sentence, three words and picture/word relationships, all of which help to expand the child's vocabulary and understanding. Excellent graphics are used to reinforce the teaching. All three programs are provided on each tape and are compatible with disks.

COUNTING: £6.00

Like 'THE GARDEN' this program uses good graphics to interest the child whilst engaged in learning. Various levels can be chosen with a maximum number of 20. Aural stimulation can be selected if required and allows the child to do the counting in various ways, it can even be done with eyes closed. The objects for counting are rockets that blast off, flowers which bloom, jack-in-the-boxes that jump etc. and are used to stimulate interest. Makes counting fun.

TAKE-1: £6.00

TAKE-1 is by John Sekula, the author of the acclaimed COUNTING program above. This new release concentrates on subtraction and again uses excellent graphics including sideways scrolling to gain the child's interest. Suitable for children counting up to 20 but the graphics are suitable for all. Recommended and praised by many teachers and parents. Give your children the start they deserve.

MATCHING: £7.00

A bumper tape of four programs covering numbers, words, shapes and patterns. Graphics have been deliberately minimised to avoid distraction from the subject. They are ideal for infants and pre-school children. 'NUMBERS' provides various levels and alternative methods for counting. The space bar can be used as a counting stick and a visual and aural reward is given. 'WORDMATCH' again has various levels and the child is required to match the subject word with its partner which is in the displayed list. There is a choice of moving the word or moving the marker. 'SHAPE MATCH' can be of use to all ages and has a wide difficulty span. The cursor keys are used to move the subject shape onto the correct match and they will then merge if the answer is correct. 'PATTERN MATCH' is similar to 'SHAPE MATCH' but colour patterns are the subject instead of the geometrical shapes. This program introduces shape, colour and relational concepts and can even be of help in detecting colour blindness, although any suspicions should be confirmed by an expert.

INTRO: £10.00

INTRO is a simple computer programming language which uses the immediate visual response of 'turtle graphics' to introduce a number of programming concepts and techniques and to illustrate a variety of mathematical ideas in the areas of measurement, pattern, angle, and the use of variables. INTRO is similar to LOGO but with some important and deliberate differences. The most obvious is the screen layout which sets a section of the screen aside as a scratch pad with room for instructions to be displayed. Another important difference is in the way procedures are defined, in LOGO you must decide before typing in the procedure but in INTRO the current program can be stored as a procedure by typing STORE NAME, or whatever. INTRO has a very full instruction set, permitting great flexibility in handling graphics and in addition allowing access to the BBC's mathematical functions, INKEY etc. Programs and procedures can be saved to tape just like normal programs. INTRO is supplied with a comprehensive nineteen page manual as well as demonstration programs on the tape. INTRO can be transferred to disk but files must still be loaded and saved on tape.

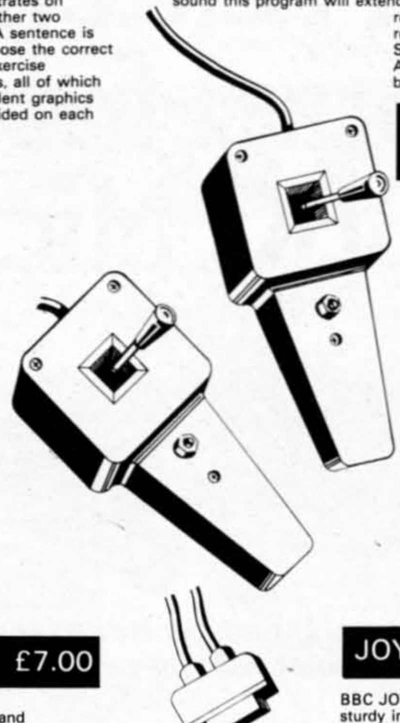
HUE-MEN £6.00

Designed and written especially for pre school children this program is loved and admired by everybody that sees it. It has proven a big hit with children and adults alike and no collection is complete without a copy of HUE-MEN. This program is the best example of animation in MODE 7 seen to date, yes MODE 7. We cannot praise this program too highly and it is actually educational too. The subject is colour and HUE-MEN succeeds in extending young children's attention span without the teaching element even being noticed. Recommended for children of all ages.

SHAPE-MEN: £6.00

SHAPE-MEN is by the same author as HEU-MEN, Phil Reynders, and uses similar concepts to aid in shape recognition. Again using MODE 7 and sound this program will extend the child's attention span considerably. A real must and both these programs are recommended by PRIMARY EDUCATIONAL SOFTWARE REVIEW.

ALL educational software is supplied on tape – but can be easily transferred to disk.



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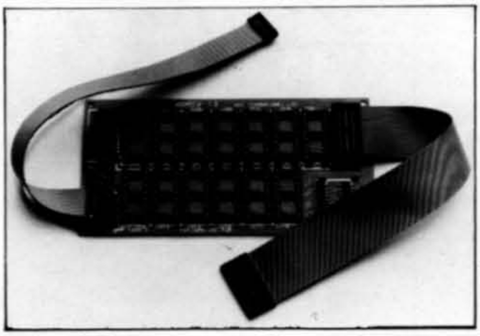

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Thanks for the memory

By ALEX DRAKE & JAMES RIEHL

IT does not take too long before the programs you write for your BBC get so large that you start running out of memory.

This is particularly true if you have added a disc drive or other ROMs that require some of the available memory for work space.

There are many different ways to get round this problem. Unfortunately, most involve additional expense.

If you don't require access to your disc drive during the running of your program – in other words, you don't want or need to load data or save data on the disc – then there are ways to use the DFS work space.

With the Watford DFS, for example, you can use the *MLOAD command to relocate your Basic program to say &0E00 before execution (ignore the "Bad Program" message). If you then set PAGE=&0E00 you are ready to run your program.

After finishing you can get the disc system back by entering *DISC, although the effect on your existing program will be somewhat devastating.

One of the more common ways to conserve memory is to use the CHAIN command. In BBC Basic you can end one program with a command to CHAIN another.

What this does is to load in a new program over the current one. This is useful in situations where a series of more or less independent programs need to be executed.

After the execution of a CHAIN command the integer variables A% to Z% are unchanged. That is, their values can be used by the next program. However all other variables are lost.

You cannot assume that the value of a variable set in the first program can be referred to in the chained second program. This severely limits the use of the CHAIN command.

An extremely powerful technique for disc users is to use overlays just as we often had to do on those now somewhat primitive mainframes and minis of the 1960s and '70s.

Essentially what is done is to write your programs in such a way that there are large sections of code (procedures) that are more or less independent.

The structure of the program should be such that this set of procedures do not require each other. They can then be loaded into the same place in memory and executed when needed.

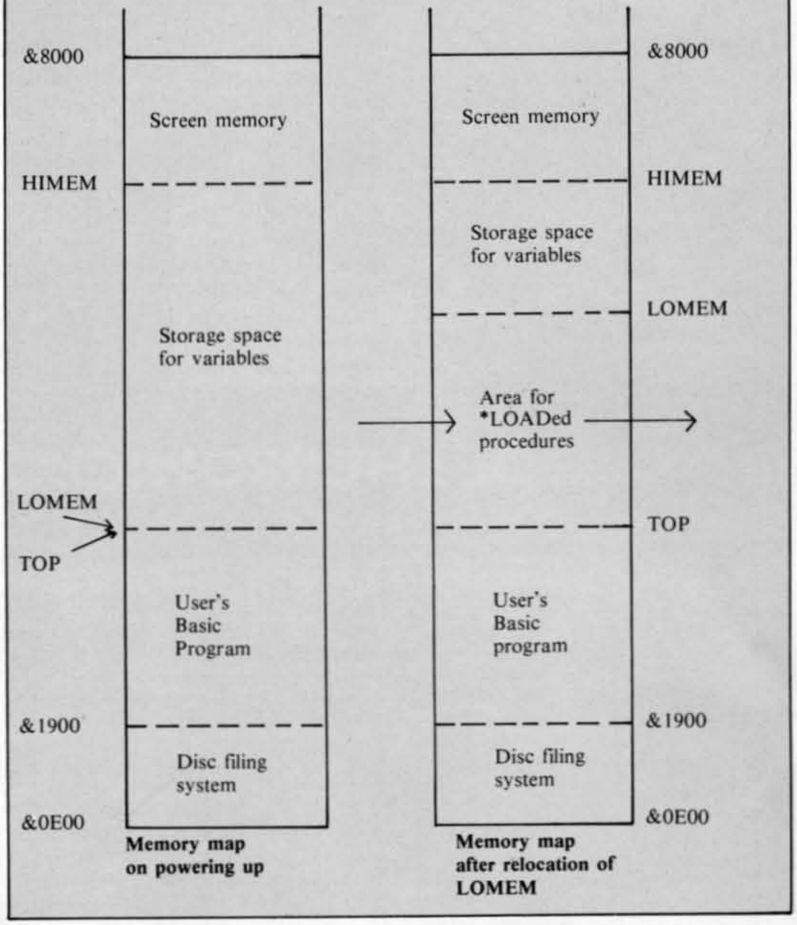
What you need to be able to do, of course, is to ensure that when you are loading in procedures and executing them, the variables you need are not affected. In order to do this we need to know a little about how the BBC stores variables.

In Figure I we show a portion of the BBC's memory map. Note that programs are loaded at the location denoted PAGE, the end of the program is given by the variable TOP, and the variables themselves are stored in memory locations beginning at LOMEM (BBC User Guide, Page 414).

Normally the values of LOMEM and TOP are the same, and the values of variables are stored just after the program.

What we would like to do is to relocate this variable storage area to some other place, and load in our various procedures as we need them

BBC Micro memory map


&8000
Screen memory
HIMEM
Storage space for variables
LOMEM
TOP
User's Basic Program
&1900
Disc filing system
&0E00
Memory map on powering up
&8000
Screen memory
HIMEM
Storage space for variables
LOMEM
Area for *LOADed procedures
TOP
User's Basic program
&1900
Disc filing system
&0E00
Memory map after relocation of LOMEM

From Page 47

after our main program.

This can be done by setting LOMEM to a larger value – making sure, of course, to allow enough room (HIMEM-LOMEM) for all the variables that we have.

Exactly how much room to allow for variable storage depends obviously on the requirements of your particular program.

A rough estimate can be made by counting how many integer variables, real variables, and strings that you have, each particular type of variable requiring a specific memory allocation as described in the User Guide (Page 64).

The only thing left to do is to load in our procedures at the correct place in memory, remembering to have line numbers greater than those used in the main program.

So how do you load the procedure at the end of your main program? Well, we first have to determine how long the main program is, or more specifically, where the main program ends. This memory location is given by TOP-2.

For example, if you type in Program I:

```
10 REM PROGRAM I
20 LOMEM=&4000
30 a$="Main Program"
40 PRINT a$
50 PROC_1
60 END
```

Program I

and then type P.~TOP-2, you will find out that this program ends at location &194D (if PAGE=&1900 and you have typed it in exactly as we did, with no extra spaces).

So if we want to load our first procedure, which has been previously saved on disc as "PROC_1", we might be tempted to add the following line:

```
45 *LOAD PROC_1 194D
```

If you think a little bit about this though, you will realise that you have changed the length of your program. Right? So how do you get around this?

Well, simply insert line 45 as below, print the value of TOP-2 again, and then edit line 45 to put in the correct address. This time the program ends at location &1962.

It doesn't really matter what address you put in line 45 the first time, as long as it has four digits. Your program should now look like Program II.

```
10 REM PROGRAM II
20 LOMEM=&4000
30 a$="Main Program"
40 PRINT a$
45 *LOAD PROC_1 1960
50 PROC_1
60 END
```

Program II

The *LOADed procedure does not have to be in machine code as suggested in the User Guide (Page 393).

Just to make sure that you have done everything correctly you probably should check TOP-2 one more time to make sure that everything is consistent. Sometimes you add extra spaces without being aware of it.

There are other ways to load in your procedures at the appropriate memory location, but this method is probably the easiest.

In principle you can have many *LOADed procedures with each one being loaded at the same address and overwriting (overlaying) its predecessor.

Program III is a simple example of this.

```
 10 REM PROGRAM III
 20 LOMEM = &4000
 30 a$ = "Main Program"
 40 PRINT a$
 45 *LOAD PROC_1 19CB
 50 PROC_1
 60 PRINT "Load next procedure"
 70 *LOAD PROC_2 19CB
 80 PROC_2
 90 b$="Memory capacity increased"
100 PRINT b$
110 END
```

Program III

```
3000 DEFPROC_1
3010 PRINT "A method for "
3020 ENDPROC
```

```
3000 DEFPROC_2
3010 PRINT "extending memory"
3020 ENDPROC
```

Procedures held on disc for Program III

You are now ready to break loose from your memory constraints!

If you are writing well-structured programs, you should be able to utilise this overlay technique very easily.

You should be able to free a lot of space, do your graphics in a higher resolution mode and add all those new features that you didn't have room for before.

YOU can use the techniques outlined in this article to demonstrate how the BBC Micro accesses its procedures.

Once the micro meets an unknown procedure it enters its address in a table. When it next encounters the procedure it looks it up in the table rather than search for it.

Program IV illustrates the point. As in Program III, PROC_1 and PROC_2 are called. PROC_1 is then called again (without *LOADing anything).

Since it's the "second time of asking" the micro looks it up in its table and jumps to that address.

Because we have *LOADed PROC_2 to this address though, the micro performs PROC_2 unwittingly, thinking it has succesfully located PROC_1.

If you have "Bad Program" messages and suchlike when trying the techniques outlined in the article, it is probably because you have typed them in slightly differently and altered the value of TOP-2. Check this carefully by using:

```
P.~TOP-2
```

and amend lines 45 and 70 accordingly.

Mike Bibby

```
 10 REM PROGRAM IV
 20 LOMEM = &4000
 30 a$ = "Main Program"
 40 PRINT a$
 45 *LOAD PROC_1 19D3
 50 PROC_1
 60 PRINT "Load next procedure"
 70 *LOAD PROC_2 19D3
 80 PROC_2
 90 b$="Memory capacity increased"
100 PRINT b$
105 PROC_1
110 END
```

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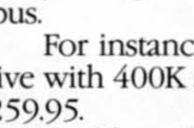

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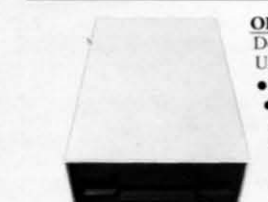

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If you are getting bored with the same old type faces, think . . .

BIG LETTERS

"The Abbot's playing space invaders again, so its back to the drawing board".

By MIKE BIBBY

THE inspiration for Font came when I was writing educational software for my children. I wanted to use Mode 5, but the character set is far too squat.

I decided that if I made them double height, the proportions would be more pleasing and it wouldn't be too difficult to do.

However I've a strong dislike of programs that, for the sake of a little more effort, could be made more general, so I wrote Font as a utility that allowed a wide variety of "type faces" to be used in the graphics modes.

The idea is quite simple really. In graphic modes the characters are composed of a set of pixels or dots, laid out in an eight by eight grid.

The micro lights different patterns of these dots for the various letters. Figure I illustrates the pattern for the letter A.

It remembers these patterns in an area of ROM from &C000 onwards, storing each character in a group of eight bytes. The first byte corresponds to the first row of the character, the second byte to the second, and so on.

As the byte for each row has eight bits, each bit decides what goes on in a particular cell of that row. If there's a 1 in that bit the micro turns that pixel on – if there's a 0 it leaves it off.

Figure II shows how the numbers work out for the letter A.

By now you've probably noticed the resemblance to the way we create user defined characters.

We can create another A (though heaven knows why we'd want to) with VDU 23, 224, 60, 102, 102, 126, 102, 102, 102, 0 where:

- 23 tells the micro what we are doing.
- 224 tells the micro the ASC number we're going to assign to the character we're defining.
- The next eight bytes teach it the pattern.

Font uses the patterns of the characters as a guide to placing rectangular building blocks on the screen.

The actual shape of the block is stored as a user defined character which I print on the screen wherever a 1 in the pattern dictates it. If it's a 0 I just move over, or down to the next row if it was the last bit.

When you think about it, you can vary exactly how much you move over or down between blocks, so you can "spread" the characters out over the screen. You can also vary the size of the blocks – allowing you to create a large range of type faces.

The actual printing is done with VDU 5 on, so that the user defined character can overlap a previous one without blanking it out.

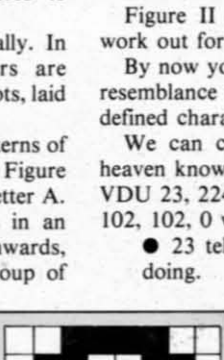
Font actually consists of two programs. The first is an assembler language program (Listing I) which will create a piece of machine code. When you run the program it will ask you for the location you wish the code to be stored in.

I suggest &900 for disc units and

→

0	0	1	1	1	1	0	0
0	1	1	0	0	1	1	0
0	1	1	0	0	1	1	0
0	1	1	1	1	1	1	0
0	1	1	0	0	1	1	0
0	1	1	0	0	1	1	0
0	1	1	0	0	1	1	0
0	0	0	0	0	0	0	0

Figure I: How A is stored in ROM in binary



60	3C
102	66
102	66
126	7E
102	66
102	66
102	66
decimal	hex

Figure II: The row numbers for A as a user defined character

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&D02 for cassette units. Whatever it is, make a careful note of it. Incidentally, it expects hexadecimal input, so you don't need to enter the '&'.

A second program (Listing II) allows you to design your typeface and also contains procedures to handle the machine code you can incorporate in your own programs.

When you run Listing I it will prompt you to save the code on tape. Make sure that you do, as it's that you'll be using from now on, not Listing I. It's saved as FCODE.

Important point now. If you want to make use of the procedures contained in Listing II in your own programs you must have FCODE in your machine. To do this you must load it with:

```
*LOAD FCODE
```

Notice that it's not an ordinary LOAD, because this is machine code, not a Basic program.

Notice that in Listing II line 60 is:

```
I%=&900
```

I% tells the micro where FCODE is stored. If you've stored it somewhere else – for example, at &D02 for a cassette system – you'll have to alter this.

As mentioned, Listing II not only shows you how to incorporate FCODE in your own programs, but also lets you create the type face of your choice.

When you run it you will be asked for the mode you require.

Try entering 2, and respond N to the special character option. You'll see a screen similar to Figure III.

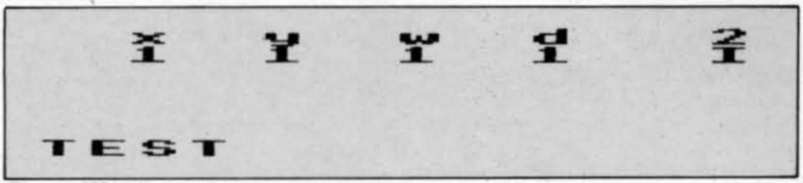

Figure III

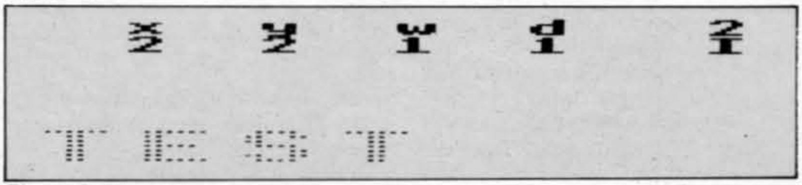

Figure IV

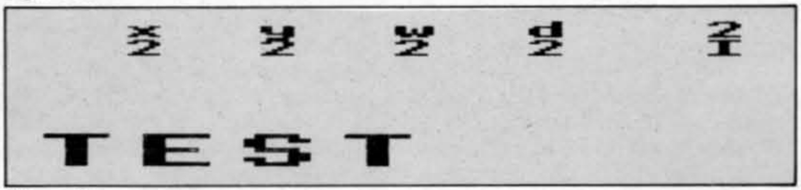

Figure V

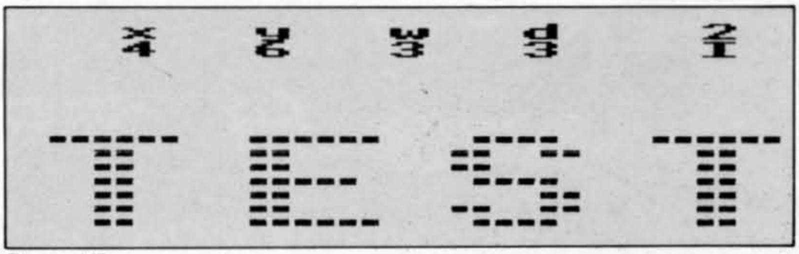

Figure VI

The word Test is printed under conditions determined by *x, y, w* and *d*, giving you an idea of the characters you'll get with each set of options.

The *x* and *y* refer to the spacing, in pixels, between the rectangular blocks you are using to replace the pixels in the characters you want in the new type face.

Initially they are one pixel apart, as normal.

w and *d* refer to the width and depth of the blocks respectively – again in pixels.

The 2 simply reminds you that you are in Mode 2.

I stands for increasing. If you press Return the screen is redisplayed with D in its place – this stands for decreasing. Press Return once more and I is back.

The significance is that if you press the X key while I is displayed, the value of *x* increases and TEST is displayed accordingly.

If you press X while D is displayed the value decreases. Return "toggles" between the two values.

The same holds for *y, w* and *d*. Escape will take you back to the beginning of the program. F will let you finish, after giving you another chance.

It's easy to get used to and great fun to play with. Figures IV, V and VI show some possible combinations.

Note that you cannot increase *w* and *d* indefinitely. Each has a maximum size of eight, being limited by the size of the user defined character we're using to define the rectangle.

x, y, w, d are important – so once you've picked the way you want your letters to look, note them down.

To use this character set in your own programs you then need to:

- At the program's start, set *I%* to the address at which FCODE will load.
- Include PROCw and PROCf in your program – it doesn't matter about line numbers.
- Have *LOADed FCODE.

You then call PROCf with the figures for *x%, y%, w%, d%* you've noted as parameters. This sets up the "font".

To print words in the type face thus chosen you simply pass them to PROCw. The first two parameters are the X and Y graphic coordinates of the start of the word on the screen and the third parameter is the string you pass to it.

So assuming you've actually got FCODE in,

```
PROCw(640,512,'A')
```

will print the letter A at the centre of the screen in whatever font you've chosen at the time (with PROCf).

Notice that:

- You can change fonts at any time.
- The font won't affect your normal printing.

The special character option allows you to actually print a large character made up of normal sized characters from the standard character set.

You could, for instance, make up a letter A entirely of As – or a user defined character of your choice.

If you want to do this, load FCODE and poke *(I%+&B8)* with the Ascii code of your character – also make sure that you've spaced out the *x%* and *y%* sufficiently in PROCf.

In Listing II I chose an initial width of

→

From Page 53

four pixels between *x* and *y* to space the characters out – *w* and *d* are irrelevant. Having called PROCf, continue with PROCw as before.

Figure VII shows the sort of results you can achieve with this technique – I've used an asterisk as the special character.

The program as it stands won't run on OS 0.1 as this doesn't support OSWORD with A=10, so you'll have to read the definitions directly from the ROM.

You'll also have to change a line in PROCf. In Listing II this is line 550. It becomes:

```
550 m%=?367
```

Listing III demonstrates just a small amount of the potential of this technique. As written it's set up for disc. Alter *location%* in line 30 if you're using cassette – I've used it rather than *l%*.

Notice that we use GCOL to change colour, not COLOUR. This is because we are writing under graphics control.

Figure VIII shows the output – my children's names. It's only fair, they started it all . . .

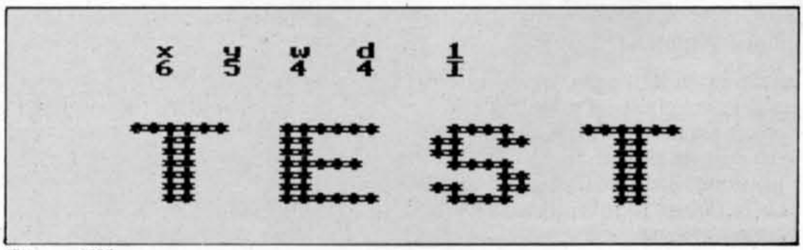

Figure VII

. . . and this is how it works . . .

LISTING I consists of two main routines. One defines a rectangular character block, and the other prints out a single Ascii character using the pixel pattern of that character as a map.

We shall concentrate on the routine *definer* (line 970). Although it's towards the end of the listing, it does precede the others logically.

This routine defines the shape of character &E0 (224) by using OSWRCH to do a machine code equivalent of VDU 23.

width holds the pixel width of the character you want. *define_row* then repeatedly sets carry and RORs an initially empty accumulator *width* times, using X as index. This puts as many ones into the accumulator as necessary to define a row.

We need this row *depth* times, so using Y as an index we use OSWRCH to send these new values. Having done that, since VDU 23 needs eight values it might appear that we should then send *(8-depth)* zeros via OSWRCH.

To avoid doing the "sum" we use *send_blanks* to send eight consecutive zeros. The ones necessary to finish the VDU23 are "grabbed" by the OS, the rest ignored. This may be inelegant, but it's effective.

The rest of the code is straighforward. Lines 110-190 set up bytes for the variables to be placed into, 210-220 making space for an eight byte parameter block or table.

start loads X,Y with the address of this parameter block and, using OSWORD with A=10, reads the eight byte character definition of the letter we want to place on the screen into the table we have set up.

It will need to have the Ascii code for the letter at *pattern,* but we'll assume that the calling routine supplies this. The rest of the routine consists of two nested loops *(outer_loop* and *inner_loop).*

outer_loop selects each row in turn from the table (indexed by Y) and *inner_loop* examines that row bit by bit using ASL.

If there's a 1 carry is set and *write* called. If not, *noprint* simply skips past this.

xpos and *ypos* hold the graphic coordinates at which the character is to be printed. These are transferred to *xstore* and *ystore.*

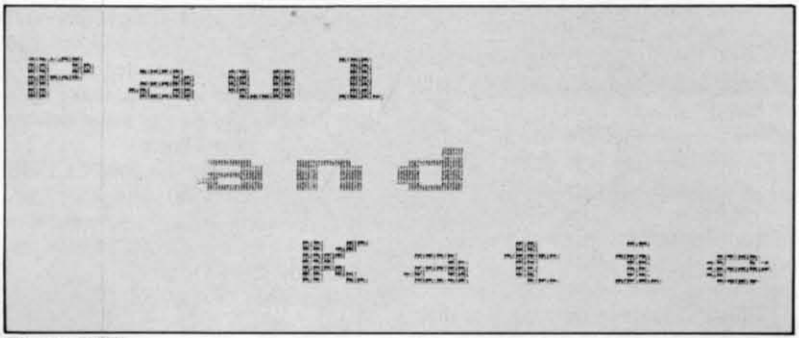

Figure VIII

ystore is decremented at the end of each *inner_loop* by *ystep,* to ensure that the next line is printed with the correct vertical spacing.

xstore is incremented by *xstep* within *inner_loop* after *writing* or *noprint* to ensure that the next printing is correctly spaced across the screen.

After *outer_loop, xpos* is updated to ensure that the next enlarged character is correctly positioned horizontally. If you think about it, you'll realise that *ypos* isn't updated since the next character should start on a level with the previous one.

write uses OSWRCH character repeatedly to:

VDU 5	joining text and graphic cursors so characters can overlap (line 780).
VDU 24,4,	*xstore, xstore+1, ystore, ystore+1.*
MOVE	the cursor to the absolute position for printing (lines 800-910).
VDU 224	printing the character (line 920).
VDU 4	separating cursors (940).

Listing II uses PROCf to set up the type face.

x% holds the horizontal separation.
y% holds the vertical separation.
w% holds the width of the block.
d% holds the depth of the block all in pixels.

In line 550 *m%* peeks &355, which contains the current mode. It then uses *f%* to convert the variables from pixel size to graphic units, storing them in *l%, l%+3* for FCODE to use.

Finally it calls *l%+&C2 (definer)* to define the rectangle as 224.

PROCw prints a string out in the style defined by PROCf. Its parameters are the coordinates to start printing at *(x%* and *y%* again – not the same as in PROCf) and the string *(w$).*

The routine then pokes each character of the string in turn into *l%+&C* then calls *l%+&15* to "print" it (lines 480-490). PROCkey simply looks for keyboard inputs.

Mike Bibby

Full listing starts on Page 183

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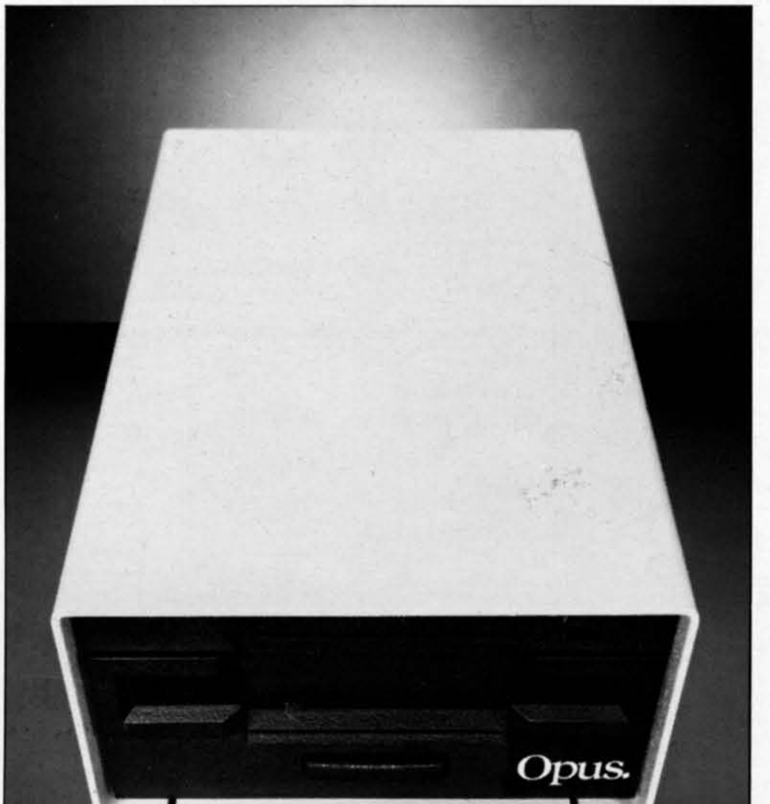

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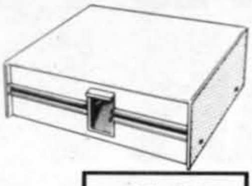

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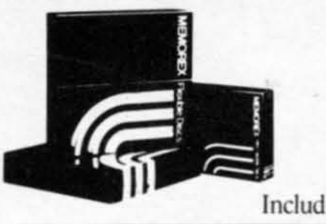

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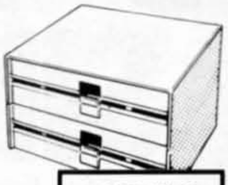

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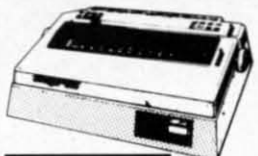

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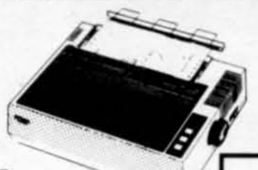

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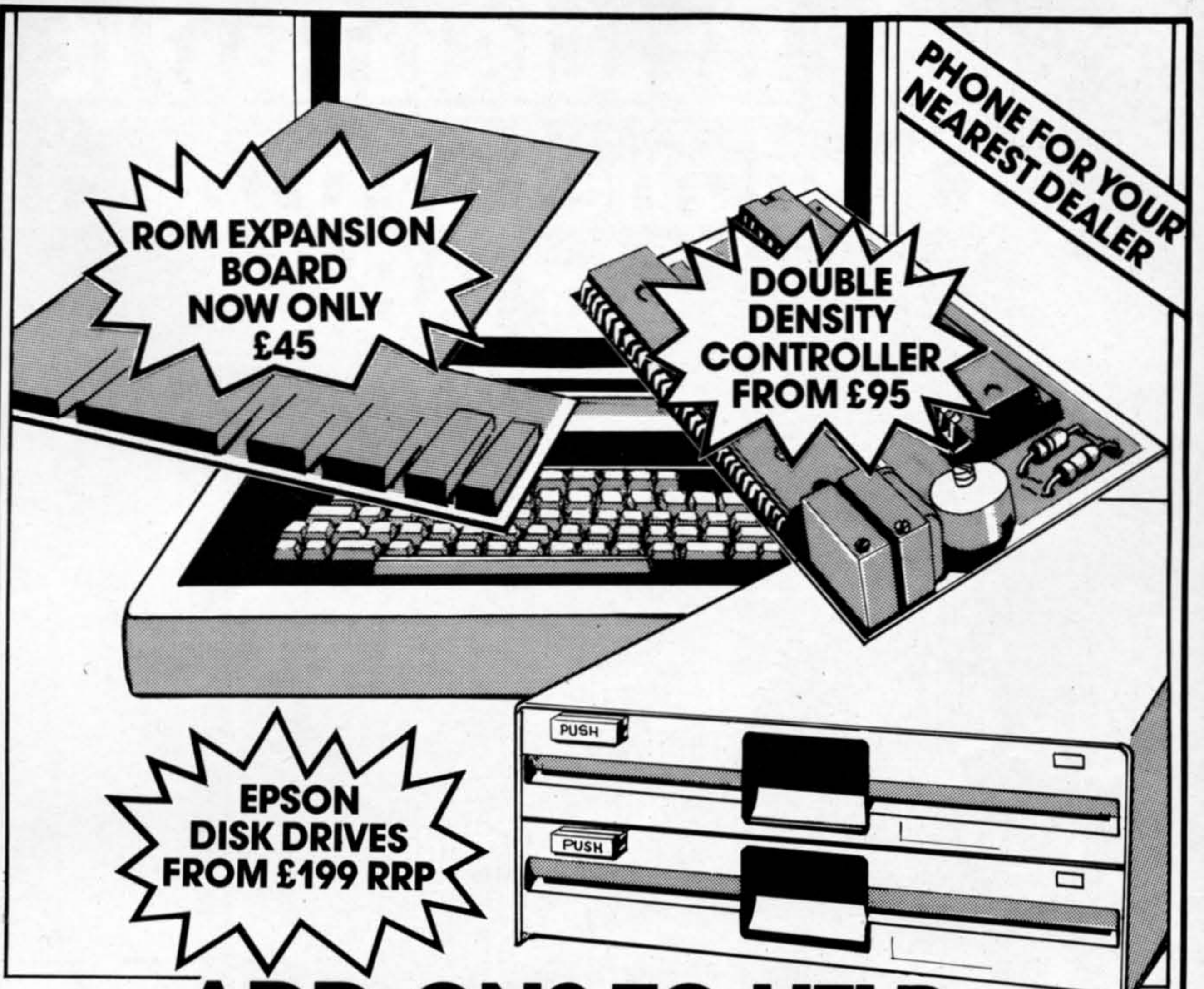
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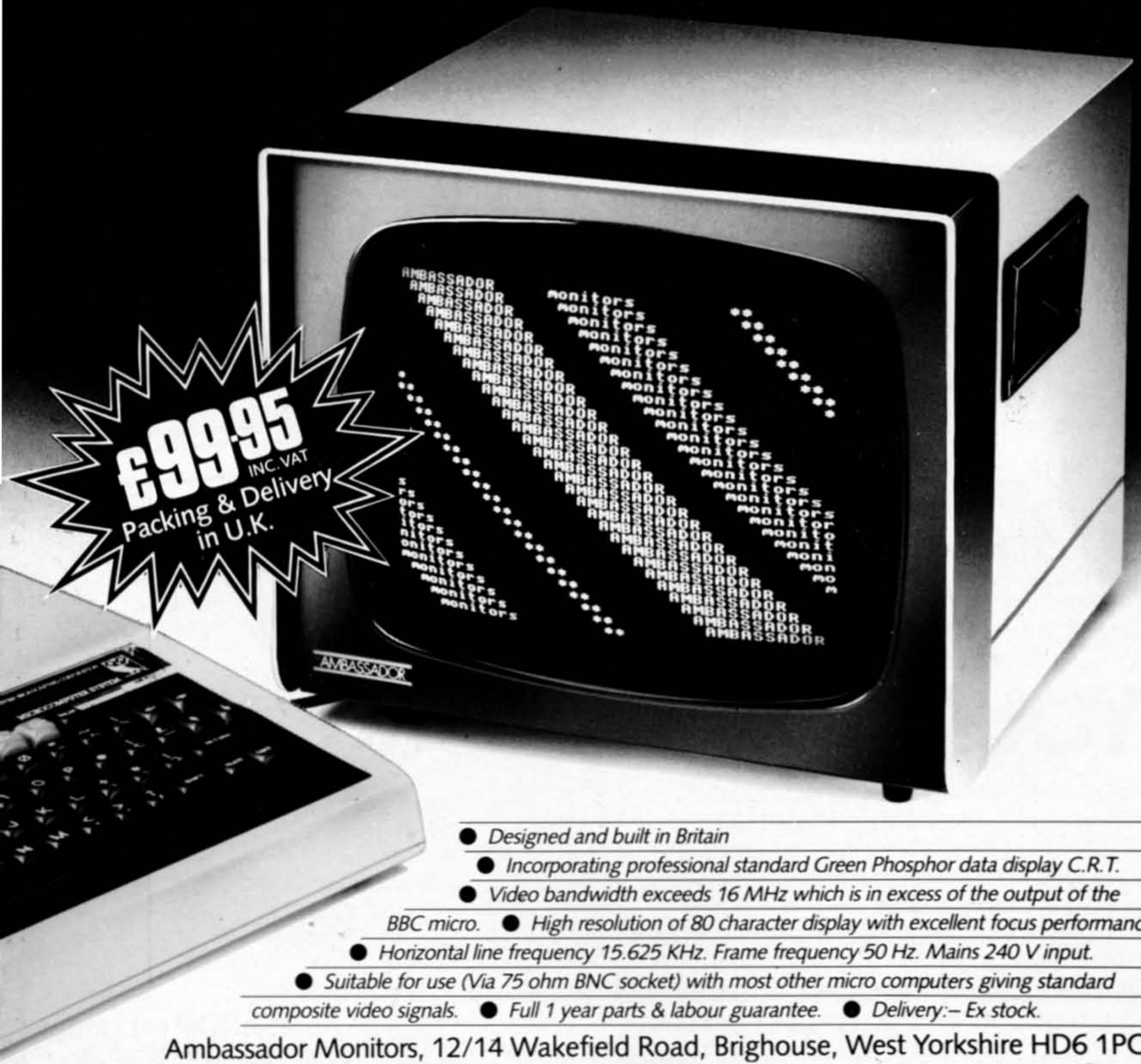

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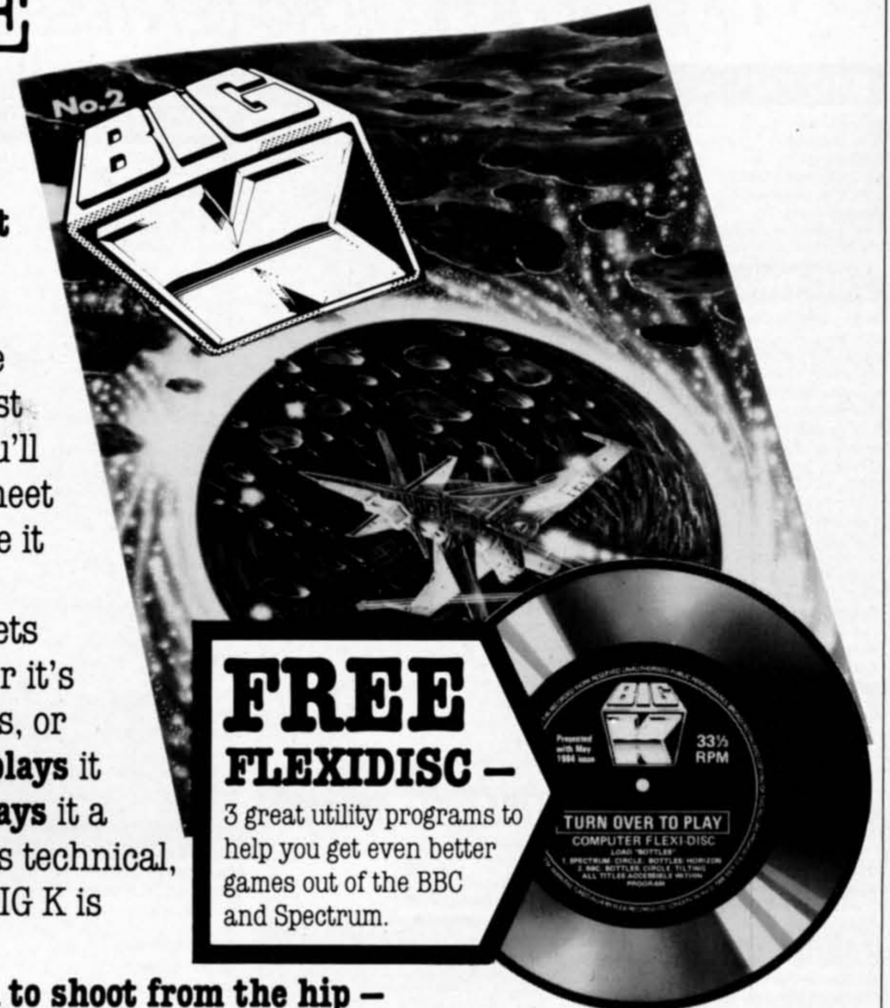

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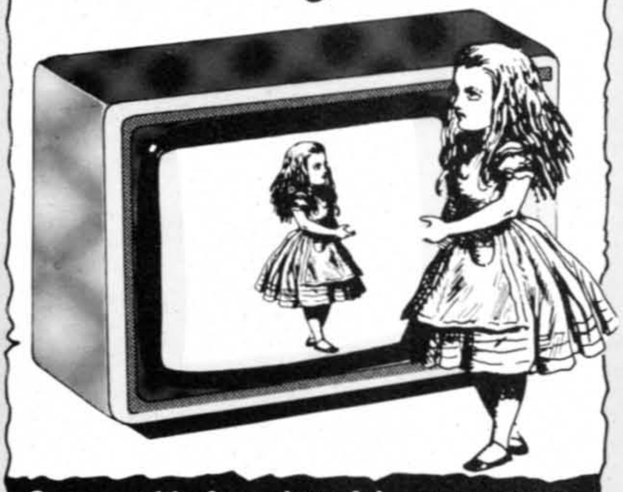
Alice through the VDU



Our monthly foray into Adventure games

Timely crib for a trip with the Time Lords

LORDS of Time was designed by Sue Gazzard, a Harrow housewife and, judging from the peculiar way the player moves through time, a Dr. Who fan.

This adventure from Level 9 had an extra sheet of hints for the reviewer as well as the usual neat booklet. Having read the extra hints on how to operate the time machine – in this case a grandfather clock – my reaction was that I definitely needed the crib.

You have to wind, turn and push things before you can visit any of the nine time zones, which the booklet tells you to tackle in numeric order. This, it says is to ensure that you have the objects needed to solve the puzzles.

Of course it doesn't ensure anything of the kind, because you are limited to carrying only four objects and there are about 80 objects to choose between.

Of these 18 are treasures and nine are special ingredients, like an Ivory Tusk, Dinosaur Egg and Evil Eye, which you have to throw into a cauldron.

As expected, the program fills the machine with compiled a-code and compressed text so there is little scope for cheating.

Like Snowball, it plays a nice little Vivaldi tune as it loads – a clever bit of interrupt programming – and then up comes the message that Father Time has "chosen youn (sic) to help defend history against nine evil Time Lords".

First time in I got an hourglass, a candle and a box of matches and then asked for a LIST of what I was carrying. The answer was "an old mattress".

Now for a quick look at the nine zones, so let's go into the clock to find them. The periods we can choose are Present, Ice Age, Stone Age, Vikings, Mediaeval, Tudor, Future, Roman and Far future (where I got stuck, so QUIT).

Now it's fairly obvious when some of the special ingredients must be. The ivory tusk must belong to the mammoth in the Ice Age, but the sabre-tooth tiger caused trouble, so back to the Present, into the cottage and get the Masai spear off the wall.

Check that it's sharp and now try KILL TIGER WITH SPEAR, which gets the response: "Only a fool would attack a Masai spear".

One of the tricks I mentioned in a previous article is to check if something exists. This program has some weird

‘The more ambitious the syntax and semantic analyser the more likely you are to get odd answers’

From Page 61

responses to this method like:

GET EYE: *"You can't see a tightly closed box".*

OPEN WALL PANEL (because the wall panels sound hollow in the Tudor mansion): *"You can't see a wall of ice blocking the way south".*

GET CAND (short for candle): *"You can't see a silver candelabra".*

EXAMINE MATCH: *"2tches are left".*

The program is riddled with these interesting slips because it is trying very hard to make sense of what you say. Many adventures insist on exact words, otherwise they respond with, "I don't understand", or, "You can't do that".

You see, the more ambitious the syntax and semantic analyser the more likely you are to get odd answers which the designers can't always predict.

The game is complex but it does not appear to have any real time paradoxes. I don't count dinosaurs living in the Stone Age which, we are told, was caused by the Time Lords' meddling.

A true time paradox should be caused by the player altering the Future whenever he alters the Past. If say, he drops an object somewhere he should find its decayed remains in a future time zone.

Such complexity is very difficult to design into adventures which, so far, only deal with where objects are and not when.

But maybe someday someone can come up with the equivalent of Isaac Asimov's "End of Eternity" or Ray Bradbury's short story "Tyrannosaurus Rex", where accidentally crushing a butterfly in the past totally alters the future.

As usual, because I can't get at the text, I haven't got very far with this game. The text has been compressed and to give some idea of how this is done, I will discuss some simple examples. Take the sentence:

the cat sat on the mat
= 22 characters

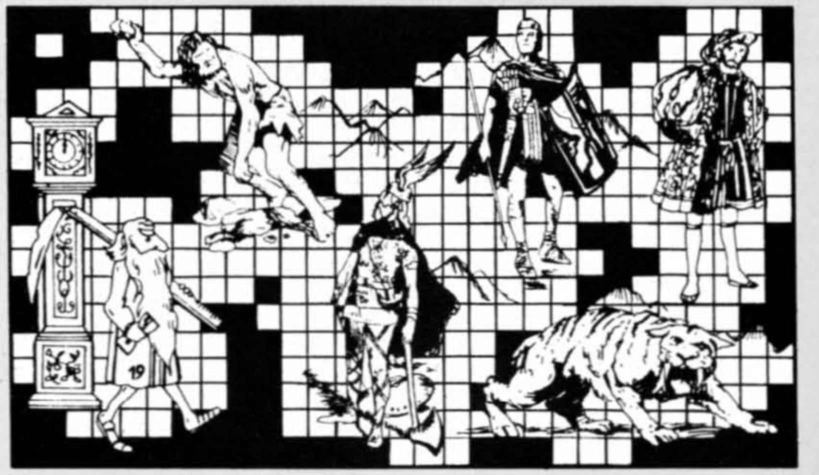
A text compressor scans this and finds that "the" and "at" are common strings of characters so it replaces them with special characters like "#" and "@" thus:

#c@s@on #m@ *= 10 characters*

The text expander gets this string and uses some simple rules like:

- *If special character then expand.*
- *If first character of sentence then make it upper case.*
- *If upper case character then output lower case + " ".*

If you have an enormous amount of text, like the Bible, then another method is to identify and code into single bytes the (1-255) most common words and use the byte "0" to mean "output the next character as literal Ascii".



Don't forget to construct a map

In this way most of the spaces disappear as well, and the text can be roughly halved.

Whichever method is chosen a further compression can now be made on the new string of bytes by applying some information theory first discussed by Claud Shannon, an American cryptologist in the Second World War. In a classic paper he explained, for the first time, why codebreaking is possible.

The reason is that all natural languages are extremely redundant – only about 25 per cent of most text is strictly necessary. To illustrate this redundancy Shannon asked people to guess, one by one, the characters in the following:

There is no reverse on a motorcycle

On average people guess two thirds of the letters in this sentence, particularly if they spot the semantic clue at "motorc" and don't guess motorcar.

Information theory has many applications and can treat ALL forms of communication as a problem in statistics, giving precise measurements of the amount of information conveyed and the efficiency of the machines that handle the information.

When we transmit messages the frequency of the characters can be exploited by giving short codes to the more frequent symbols. This is most evident in the Morse code where the letter E is the most common in most European languages and therefore has the shortest code.

Now consider a first pass compressed adventure text. Given only the frequencies of symbols in this new language, how can we design for optimum transfer properties?

The answer is stated without proof (log2 means log to the base 2):

On the average

H=–sum i=1 to N of Pi*log2(Pi)

bits should correspond to each symbol where Pi is the probability of the occurrence of the i-th symbol. The expression is called the *entropy* where H is Boltzmann's function.

A "bit" is a binary digit (0 or 1). Shannon had already shown before the war that it does not matter what number system is used in the calculations. We tend to use the base 10 decimal system, but it is simpler to build binary electronic circuits, which explains the log2 in Shannon's equation.

To show it working, suppose we have a simple language containing only four symbols A, B, C, D with probabilities 1/2, 1/4, 1/8, 1/8 respectively. A sentence in this language might be:

A C B A D A B A D A A B A C B A

The entropy of this language is:

H=–(1/2*log2(1/2)+1/4*log2 (1/4)+2/8*log2(1/8))

which is 7/4 bits per symbol.

If we represented each symbol with two bits – for example, A=00, B=01, C=10, D=11 – then the above result

‘Nobody can teach anybody how to think’

says we are not being efficient. We are not taking account of the fact that A is more frequent than the other symbols.

A better code is A=1, B=01, C=001, D=000 because then we can transmit the original sentence in 28 bits:

1001011000101100011011001011

rather than the 32 bits required by the two bit code.

Level 9 use these techniques to produce their big adventures. Lords of Time has well over 200 rooms, 750 messages and about 80 objects, plus dozens of puzzles to solve.

Compared with the early micro adventures of five years ago, which usually took about a day to solve, it's about nine times bigger and should take at least nine times longer to finish.

This raises a question I've been asked many times: how to solve adventures in general. The simple answer is that nobody can teach anybody how to think, just as nobody can teach us how to walk.

All I can do is give some guidelines and simple techniques, such as constructing a map with a matrix which I'll discribe next month.

You'll have to allow for 12 directions in Lords of Time because IN and OUT are possible. Also examine every object and search every room because the program does not always tell you everything about what you can see.

Another trick is to carry four objects and just try to GET EVERYTHING whenever you reach a new room, because the program gives a rather more detailed description of all the things you can't get.

If you are an absolute beginner and have never played an adventure before then I suggest you start with one of the simple little classics by Scott Adams.

One of his first was Pirate Adventure, written back in 1978, which is still on sale. Adams published a listing of the game in Byte in December 1980 which, if you have the tenacity, can be reduced to about 350 BBC Basic statements.

It has 26 rooms, 75 messages and about 30 objects. All in all, it's only one-ninth the size of Level 9 games and can usually be solved in 140 moves by a beginner in about two days. Nevertheless, it is an amusing little game and ideal for children.

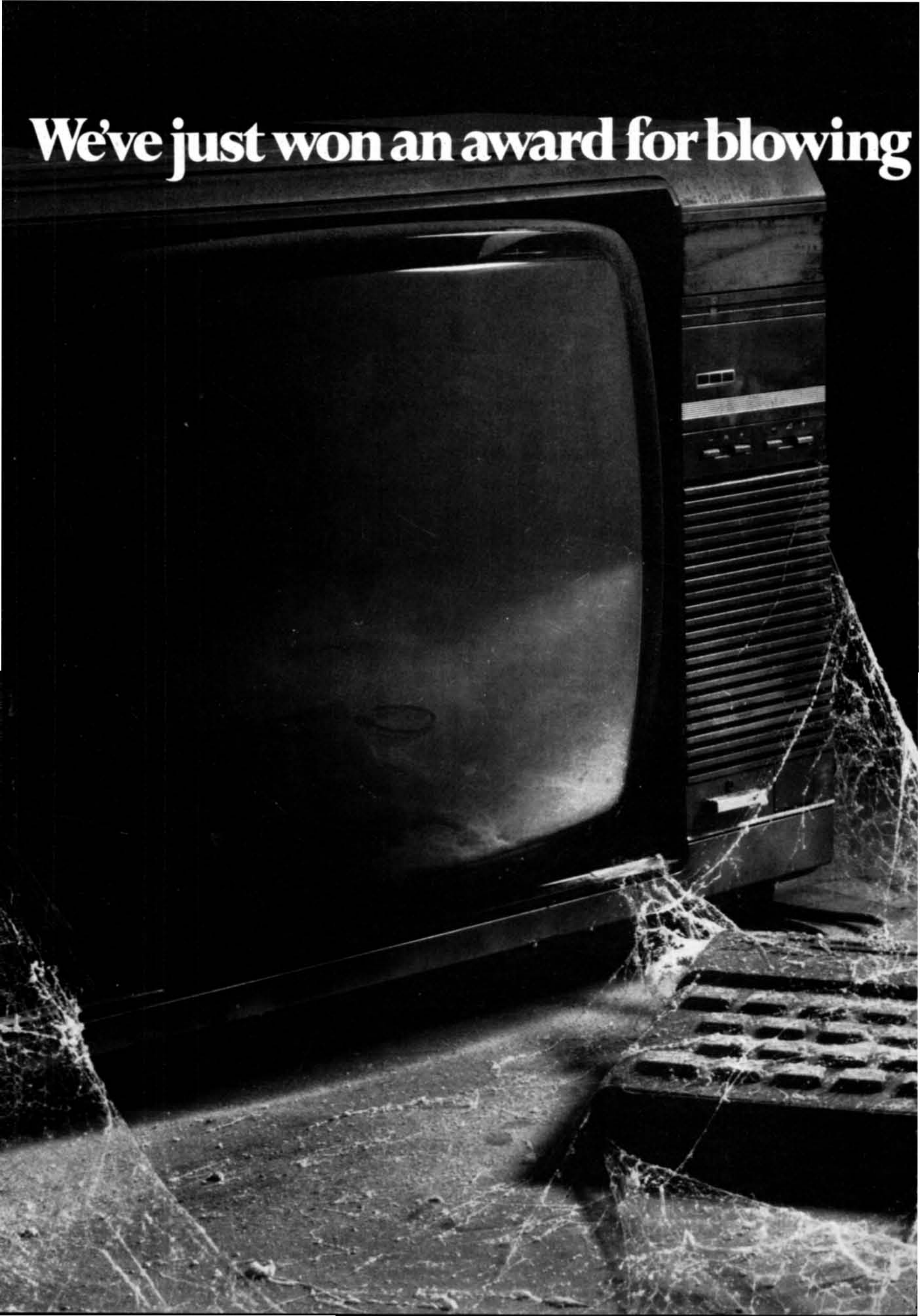
For those of you who have never been in a "twisty little maze" I have written a program to give you some idea of what they are like, and leave it to you to find out how to solve it.

Note that you can enter multiple commands like N.S.GET.LIST.SCORE and that, once again, there is a prize for the best explanation of how to get the money and take the exit.

Alice

```
  1 C=0
    :I$=""
  5 DIM M$(10)
  6 DIM M(10,10)
 10 M$="BO!JDPO!BO!FHH!!BO!BYF!!B!EBH
    HFSB!HVO!!!B!IFMNFUB!GMPXFSB!DPSL
    !!B!CPUUMF"
 20 D$=" N S E W U D NESESWNW"
 30 M$(10)="A JEWEL "
 40 GOTO 380
 50 DEF PROCdrop
 60 O$=MID$(C$,6)
 70 IF INSTR(I$,O$)>0
    THEN 100
 80 PRINT "You don't have a ";O$
 90 GOTO 140
100 X=INT (INSTR(I$,O$)/8)*8+1
110 M$(R)=M$(R)+MID$(I$,X,8)
120 I$=LEFT$(I$,X-1)+MID$(I$,X+8)
130 PRINT "You drop the ";O$
140 ENDPROC
150 DEF PROCget
160 IF LEN (M$(R))>0
    THEN 190
170 PRINT "There is nothing here"
180 GOTO 240
190 I$=I$+M$(R)
200 IF LEN (I$)=17
    THEN PRINT "You win"
    :STOP
210 IF LEN (M$(R))>8
    THEN PRINT "You take the lot"
220 PRINT "OK"
230 M$(R)=""
240 ENDPROC
250 DEF PROClist(L$)
260 IF LEN (L$)=0
    THEN PRINT "nothing"
270 FOR I=1 TO LEN (L$) STEP 8
280 PRINT MID$(L$,I,8)
290 NEXT
295 ENDPROC
300 DEF PROCscore
310 score=R*4
320 IF M$(10)=""
    THEN score=40+LEN (I$)
340 IF LEN (M$(10))>8
    THEN score=0
350 PRINT "Score=";INT (score/8)
360 ENDPROC
370 REM Start of program
380 PRINT "You are in a trap door
     maze"
390 FOR I=1 TO 10
400 FOR J=1 TO 10
410 M(I,J)=RND(I+1)-1
420 NEXT J
430 M(I-1,RND(10))=I
440 NEXT I
445 IF M$=""
    THEN 480
450 FOR I=1 TO LEN (M$)
460 M$(0)=M$(0) + CHR$ (ASC (
    MID$(M$,I,1))-1)
470 NEXT I
480 R=0
490 PRINT "You can see ";
500 PROClist(M$(R))
510 IF C=0
    THEN INPUT ">",CC$
520 C$=CC$
530 C=INSTR(CC$,".")
540 IF C=0
    THEN 570
550 C$=LEFT$(CC$,C-1)
560 CC$=MID$(CC$,C+1)
570 V$=LEFT$(C$,4)
580 IF V$<>"SCOR"
    THEN 610
590 PROCscore
600 GOTO 510
610 IF V$<>"DROP"
    THEN 690
620 PROCdrop
630 IF LEN (M$(0))<>80
    THEN 510
640 PRINT "Everything disappears"
650 M$=""
660 M$(0)=""
670 M$(10)="$1000000"
680 GOTO 380
690 IF V$<>"GET " AND V$<>"TAKE"
    THEN 750
700 PROCget
710 IF LEFT$(I$,1)<>"$"
    THEN 510
720 PRINT "Now find the exit"
730 M$(10)="THE EXIT>"
740 GOTO 380
750 IF V$="LOOK"
    THEN 490
760 IF V$<>"LIST" AND V$<>"INVE"

    THEN 800
770 PRINT "You have-"
780 PROClist(I$)
790 GOTO 510
800 D=INSTR(D$,LEFT$(C$+" ",2))/2
810 IF D=0 OR M(R,D)=R
    THEN 850
820 R=M(R,D)
830 PRINT "You go ";C$;" through
     a trap door"
840 GOTO 490
850 PRINT "You can't do that"
860 GOTO 510
```



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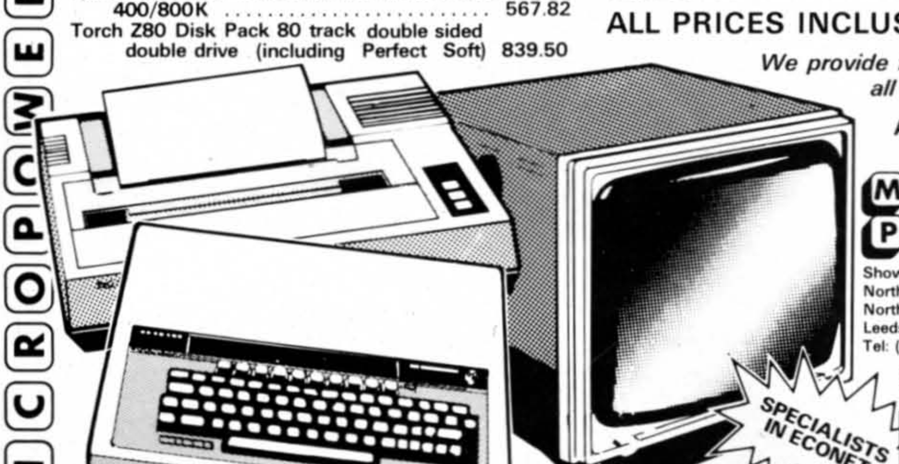

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Beginners' guide to spreadsheets

ONCE upon a time in the days of yore when personal computers had only just been invented (this is around 1974), two men working at NASA . . . ***please note before going any further that this story is apocryphal and may very well bear no relation to the truth whatsoever . . .*** **two men working at NASA thought up a rather good idea.**

They realised that this idea could best be exploited using personal computers. So, in the now familiar manner of capitalistic entrepreneurs, they set out on their own in order to market their newly discovered idea and thereby to make their fortune.

The idea came to fruition as Visicalc, the program renowned for selling more Apple microcomputers than any other product and which spawned the now highly acclaimed Visicorp Corporation.

Visicalc was the first spreadsheet program and it made them their fortune. It was the embodiment of an idea which was so simple and in the end so useful that the reason why nobody thought of it before has never ceased to be a source of wonder.

To understand the principle behind any spreadsheet program it is necessary to imagine a huge sheet of paper marked out into squares by a large number of columns running vertically and a large number of rows running horizontally.

Any one of these squares – normally known as cells, boxes or slots – thus created can then be uniquely identified by giving a reference to the column and to the row in which it lies.

Normally the columns are referred to by letters, the leftmost column being denoted as column A, the one to the right of that column B and so on all the way to Z.

After the twenty-sixth column they may be referred to by combinations of letters such as AA, AB, AC, BA, BB, BC, etc. Rows are referred to by numbers from row 1 at the top, followed by row 2 and row 3, and so on.

You would then refer to the cell in the top left hand corner of your imaginary piece of paper as cell A1 and the one three columns to the right and four rows down from this as cell D5.

A spreadsheet program simulates such a piece of paper internally and allows one to interact with it, writing into the cells one of three things – either a label (that is, just a piece of text), a value (a straightforward number such as 103.45) or (and this is where the whole power of the spreadsheet lies) a formula which uses values in cells from other parts of the piece of paper.

As a very simple example of this, let us imagine that we wish to compute a profits figure which is obtained by subtracting a costs figure from a sales figure.

Into three cells underneath each other we would put three labels – one for sales, one for costs and one for profits. These simply serve to keep track of which figures mean what.

Next door to the sales label we would put a figure, such as 200. Similarly, beside the costs label we would put a figure, say 95.

Underneath the costs figure and next door to the profits label we would put a formula. This might be +B1–B2, which would mean: "Take the value found in cell B1 and subtract from it the value found in the cell B2".

Assuming that these two cells hold the corresponding figures for sales and costs the result of this computation would be 105. This is the number that would then be displayed when the sheet of paper is viewed. It might look like this:

	A	B	C
1	Sales	200	
2	Costs	95	
3	Profit	105	
4			

It should be stressed here that there are therefore two pieces of information concerned with a cell which holds a formula. The first of these is the formula itself – in the case described this is +B1–B2. The second is the number which is the result of evaluating this formula.

When looking at a spreadsheet all numbers look the same, whether they are values entered directly – that is, the raw data – or the result of some calculations.

It is only by looking at the entry for a particular cell that you can determine the origin of the number displayed in that cell.

As the example now stands we can see at a glance that the sales were 200, the costs were 95 and that, not surprisingly, the profits were 105.

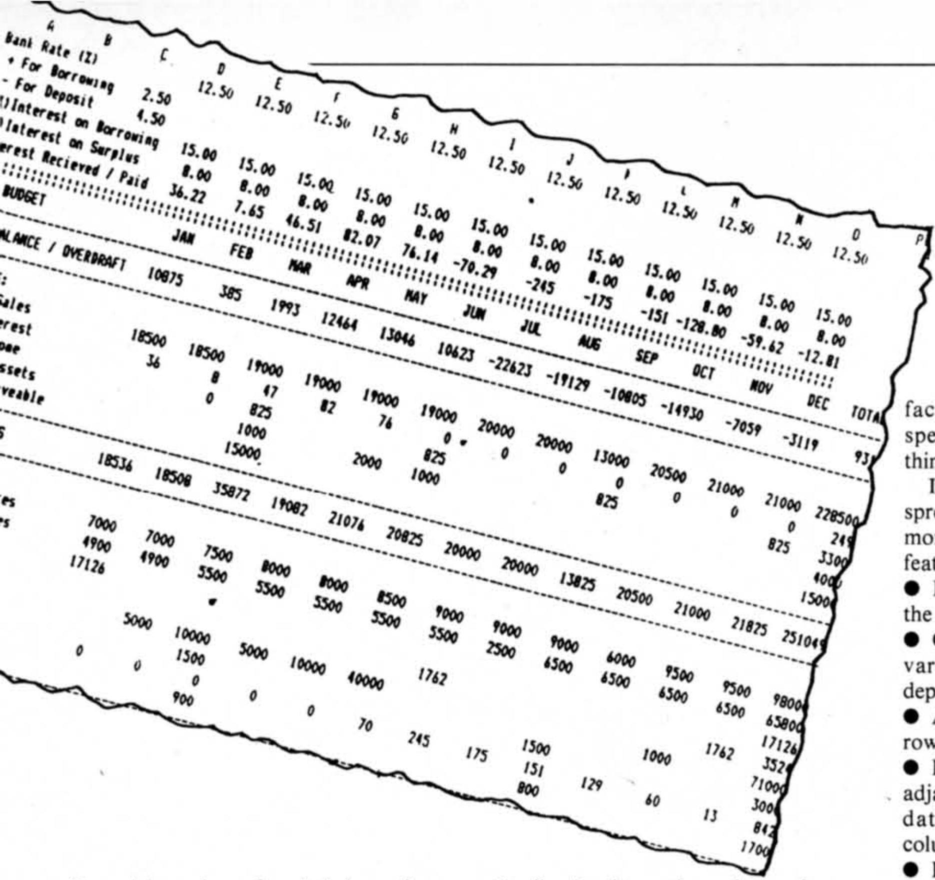
If then we discover that our figure for costs was wrong and it was, in fact, 108 not 95, we could simply change the value corresponding to costs to the required value.

The value of the profits cell would then automatically change from 105 to 92.

Let us extend the principle of this example and imagine that these three figures are, in fact, those for a particular month and that, in their turn, they affect quarterly and yearly figures.

It is not difficult to see that a change to one figure which was wrongly copied might have extremely irritating repercussions if the calculations were being done by hand.

All totals which depended on that figure would have to be laboriously re-calculated using a calculator, a rubber and a distinctly unimpressed human.



Spreadsheets have found their use in two major areas.

The first is in doing calculations which involve large numbers of figures which need to be tabulated, added, subtracted, totalled and generally mutilated in other varied and interesting numerical ways.

The second area in which they have been found to be extremely useful is in playing "What if . . .?" games.

Spreadsheet layouts can easily be used to answer questions such as: "What is my total payment on a TV set if I enter a hire purchase agreement with a down payment of £200, at an interest rate of 15 per cent over three years, and what if I were only to make a down payment of £150 . . .?"

Financial managers have spent many happy hours using spreadsheets as tools to answer more difficult questions along the same lines.

In order for a program to be considered a spreadsheet it must exhibit a number of basic abilities. First it must enable the user to view a section of the sheet on the screen.

Moving around the screen, inspecting and updating cells, erasing their contents, moving directly to particular cells – all these are functions which are used constantly and must therefore be simple and uncomplicated.

No hunting for the right function keys, changing direction before moving, and so on.

Replication is another primary function. This enables a formula to be repeated many times along a row or a column.

For example, this means that a formula which adds up the column of figures above it and then multiplies the result of this by a constant factor need not be entered more than once despite the fact that it may be needed 12 times.

Replication is used a great deal, even in simple sheets, and it must be powerful and at the same time easy to use.

It is imperative that the sheet has some reasonable number crunching facilities as well as the normal arithmetic functions.

A spreadsheet program would be pretty useless without some ability to provide totals, averages, maximums, minimums, statistical and circular functions.

It is perhaps unnecessary to point out that such facilities would be useless without both the ability to save and restore sheets from tape or disc and also to take a hard copy by printing out some or all of the sheet.

With this basic repertoire the spreadsheet would have the same power as a good programmable calculator, with all the advantages of a screen display and backing store.

However since Visicalc was first produced there has been an ever-increasing demand for spreadsheet programs to have more and more facilities for doing more and more spectacular and more complicated things.

It is not unreasonable to expect a spreadsheet program to provide a little more than the basics. Some of the nicer features might include the following:

- Facility for editing entries (to prevent the need for re-typing large formulas).
- Conditional statement, allowing for a variety of calculations to be done depending on data entered.
- Ability to insert, delete and move rows and columns automatically.
- Facility for moving the cursor to an adjacent cell after entering a piece of data (useful when entering large columns of figures).
- Facility to specify the format of the data displayed in a cell (whether text is left or right justified, how many decimal places to be displayed, etc) both for the whole sheet and for an individual cell.
- Underline facility.
- Facility for splitting the screen into a number of separate "windows", so that one can simultaneously view different parts of the sheet.
- Variable column width applicable both throughout the sheet and to individual columns.
- Choice of whether re-calculation of the whole sheet is done whenever a piece of data is entered, or only when specifically requested.
- Choice as to the direction of recalculation – which cells are worked out before which others.
- Facility for reading and writing individual cell entries from random access files, enabling sheets to be set up as templates for different data which can then be captured using, say Basic programs.
- Facility for merging different sheets together.
- Facility for using the colour capabilities of the computer, a feature which seems to be sadly lacking from a great many "serious" programs.

A spreadsheet incorporating all these advanced facilities would make a very powerful package indeed. However, it is rare to find such a program. Designers

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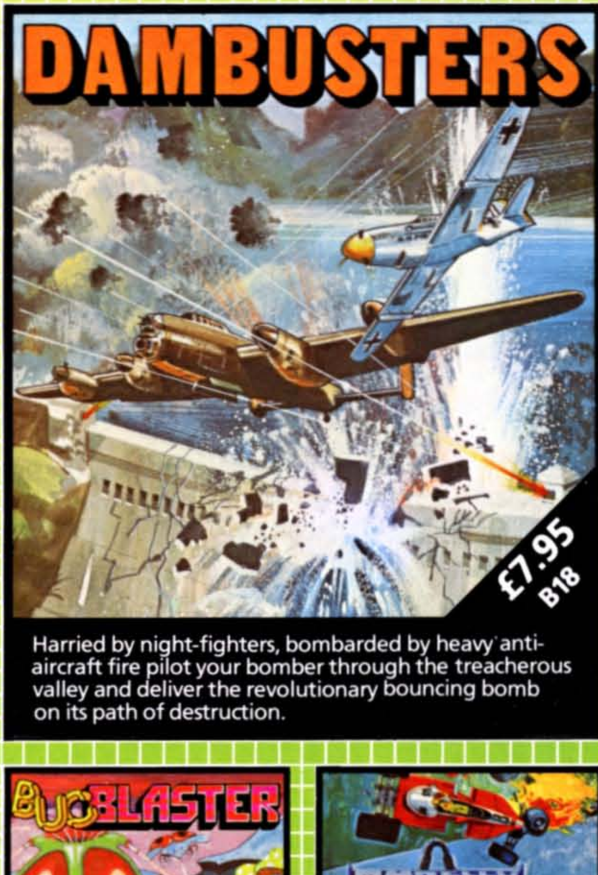

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of spreadsheet programs tend to emphasise some points and not others.

It is also true to say more features add to the price of a package. One tends to get what one pays for.

The choice of which spreadsheet program to buy must depend, for the most part, on the uses to which it will be put.

Buying a program which has only a minimum of functions is probably good enough for applications at home. Business applications, on the other hand, will undoubtedly require more sophistication.

It is important to have a demonstration and a thorough perusal of the documentation of any package before buying. If necessary spend a long time actually reading the manuals before buying a product.

Avoid buying a package from any retail outlet which is unwilling to let you play with a product before buying it.

My preference is to go for programs supplied in ROM. Not only are they always on hand when needed but, particularly for tape users, the hassle of loading a program can be more bother than it is worth.

It also seems a shame to waste valuable RAM space on intransient programs when Basic is lying idle.

Does anyone else find it strange that there are so few packages available in ROM? – I mean why on earth is the language Lisp being sold on tape?

It is worth pausing briefly to consider the future of the BBC Micro as a machine for serious applications such as spreadsheets and relational database management systems.

Packages of this kind produced so far have not been of a very high standard, particularly when compared to those available on CP/M machines of similar price to the BBC Micro.

It is a shame that Acornsoft, the company with the most credibility among software buyers, does not encourage the production of high quality applications programs by approving and commissioning software more readily than it does.

If the British Broadcasting Corporation's micro is to survive in the business market, software of a much higher standard than that which has emerged so far will have to be produced very soon.

VIEWSHEET

‘Succeeds in providing basic functions – but what a plethora of windows’

By DAVID BROWN

VIEWSHEET is a ROM-based spreadsheet program marketed by Acornsoft and written in house, rather than commissioned from another software house.

The pre-release version came with a pre-release type manual. It is therefore not possible to comment on the presentation of the documentation as it will finally appear, only on its content.

There is little doubt, however, that the final form of the package will be up to Acornsoft's usual high standards.

The manual is very well written. The first part is a "try this and watch what happens" tutorial approach which assumes no prior knowledge of spreadsheets and expects a reasonable standard of intelligence from its reader.

There are consequently no condescending "Did you notice what happened then . . ? I bet Teddy did! . . ." lines to make one want to rip the book to pieces.

The tutorial covers all the facilities offered by the program, not just the simple ones. The second part is a more curt reference section which concisely explains all available facilities.

To access the spreadsheet one types *SHEET or *SH. This puts one in the Viewsheet command mode from which one can load, save and print sheets as well as perform a number of other functions, including changing mode.

The system works equally well in all seven modes, which means that those using TV sets don't have to squint at 80 column layouts and those with particularly bad eyesight can use Mode 5 if they wish.

The foreground and background colours can be changed to good effect using the usual Ctrl-S,n,n,0,0,0 technique.

Mode 3 with yellow writing on a blue background makes the whole system look very attractive and is more restful on the eyes than white on black.

Pressing Escape takes you into sheet mode, in which you can manipulate the sheet in memory. Pressing it again takes you back into command mode (Wordwise users will have no problems here).

One thing that did strike me is that there is no use whatsoever made of the *HELP command. It seems unlikely that ROM space is at a premium, and it therefore seems a shame not to make the most of this facility, even if only to provide a list of commands available in command mode as is done in the DFS ROM.

The maximum size of the sheet itself is 255 columns by 255 rows, which means there is no real restriction on the size of the application save that imposed by the amount of memory. *(For those with an academic interest in such things, the package will work with the 6502 second processor.)*

Facilities are all fairly standard. Moving around the screen is simply a matter of using the cursor keys.

Unfortunately however, the GOTO cell function is rather awkardly hidden on function key number seven.

All cell entries are simply typed in and once entered they are interpreted to be values or labels.

Very annoyingly, there is no facility for forcing an entry to be interpreted as a label so that 1981-82 comes out as 1899!

As one would expect, ranges of values can be totalled, averaged, "minimum-ed" and "maximum-ed"

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without difficulty. Replication is done in a standard way and is both powerful and easy to use.

Rows and columns can be inserted and deleted, although accidental deletion can be protected against.

The numerical (but not textual) format of the information can be specified on a cell or window basis. The default row and column headings can be redefined or even turned off.

There is a comprehensive IF statement and a facility for reading and writing elements of random access disc files. At first sight it seems that nothing has been overlooked.

Unfortunately there is one major oversight. Presumably in order for the reverse video cursor to show up in Mode 7 there is a mandatory gap between columns which cannot be filled.

This means that any text which is entered into the sheet has to be typed in on a one word per cell basis.

If you wish to write "Uncommunicative" on your sheet, you either have to have a column width of 15 (in which case one can only get about three columns on a screen) or be satisfied with something along the lines of "Uncommu nicativ e". As a result headings, and for that matter all labels, are a pig's breakfast. To compound the error, column widths are not variable.

One can only suppose that the answer is to transfer the computed sheet, complete with mnemonic labels, to a word processor – one feels sure that Acornsoft would recommend View – and tidy up the dog's dinner when the number crunching has been completed. That strikes me as being a distinctly unsatisfactory solution.

Having got over that hurdle we come to another problem. Acornsoft has gone overboard on windows. One can define up to 10 (yes 10) screen windows and another 10 print windows.

The idea is to enable you to dissect your sheet into logical subsections in order to view and print these as inter-related sub-sheets.

There is a facility for loading and saving window definitions separate to the sheets, thus enabling you to swap from one perspective of the sheet to another by loading in a new window definition.

While this is a very laudable aim, there is a considerable obstacle. Defining and manipulating window definitions is uncannily difficult, being about as user-friendly as a kick in the teeth.

Fumbling around defining and redefining windows in order to get the display right is not easy. One might feel that the struggle would be worth it if the end result were to prove useful, but I have yet to be convinced.

My view is that an ability to split the screen into two – or at most four – different windows is a very useful facility, but the usefulness of 10 screen windows is dubious.

The printer windows, which allow one to define the area of the sheet to be printed and to some extent the format of the output, could be useful for very big sheets.

More work needs to be done by Acornsoft to find the best compromise between flexibility and user friendliness.

In conclusion, Viewsheet's major failing is to provide adequate facilities for textual labelling. Apart from this it succeeds in providing all the basic spreadsheet functions in a well presented package.

The only real advantage it has over its competitors at the moment – and one which may evaporate before its release – is that it is ROM based. Acornsoft is capable of producing better programs.

ULTRACALC

‘It has practically everything that a good spreadsheet should have’

By S.K. KHASNAVIS

LIKE other ROM based software, Ultracalc – a sophisticated spreadsheet program – fits into one of the extra ROM sockets in the BBC Micro. The accompanying 80 page manual, which is extremely well written, gives precise fitting instructions.

To call the ROM into action you have to key *CALC, which immediately brings the sheet onto the screen with two beeps.

If you want the computer to start-up in Ultracalc, the ROM can be fitted into the right-most socket, and the Basic ROM moved one step to the left.

It is a large spreadsheet with 63 columns and 255 rows. The columns are named A,B,C,D . . . Z, then AA, AB, AC, AD . . . AZ, and finally BA, BB, BC, up to BK. Rows are numbered 1 to 255.

In Ultracalc the top portion of the screen above the column scales is called the information area. This consists of three lines, the first showing the status of the page.

At the left hand corner, two characters, such as A1, indicate the coordinates of the current cell.

To the right of it, the display reads "BLANK", which means that the cell does not contain anything. After this appear the words INPUT OR COMMAND, which indicate that Ultracalc is expecting instructions.

When anything is typed, it is first shown on the input line, and as soon as Return is pressed, it is entered in the cell bracketed by the cursor. The entry then moves up from the input line to the contents line.

Below these three lines, a column scale such as A, B, C, etc., is displayed across the screen, and in the left hand margin appear the row numbers, starting from one.

With the default column width of seven characters, the screen can show four columns and 20 rows at a time.

The cursor indicates the user's position on the page, and can be moved by the micro's four arrow keys one cell at a time in the direction of the arrow. Using the arrow keys in combination with the Shift key will cause the cursor to jump four columns or 10 rows at a time.

There is also a GOTO command /G(area) which will make the cursor go to any desired cell.

In addition to supporting arithmetic and mathematical operators and functions, it has several built-in facilities making it easy to use.

The column width can be individually

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or globally varied up to 40 characters wide, giving the user complete freedom to define a broader width for, say, the first column A on the left normally used for titles and text.

A powerful "SUM" facility is available for easy totalling of a column or row or even a whole area without having to type all the cell references. To do this, you have to type SUM(area), and Ultracalc will total up all the values in the defined area and display it in the current cell.

Editing is excellent. You can edit all the data placed in the various cells with the help of function keys f8 and f9, and the Delete key. All you do is place the cursor on the particular cell and press Shift and Copy together. This puts the contents of the cell in the input line.

The flashing cursor can then be moved to the left by f8 and to the right by f9. The Delete key will remove the character above the cursor, and a new character can be typed in. Pressing Return will send the edited entry to the cell concerned.

The manual describes a numeric entry as "value", and a text entry as "label". A thoughtful feature is that Ultracalc automatically senses an entry to be text string or numeric and marks it accordingly as a label or a value, showing it as such on the top reference line.

This is most convenient, as one does not have to key in double quotes to identify text entries as in a few other sheets. There is provision to override this automatic feature, and to force a numeric entry to be read as text or "label".

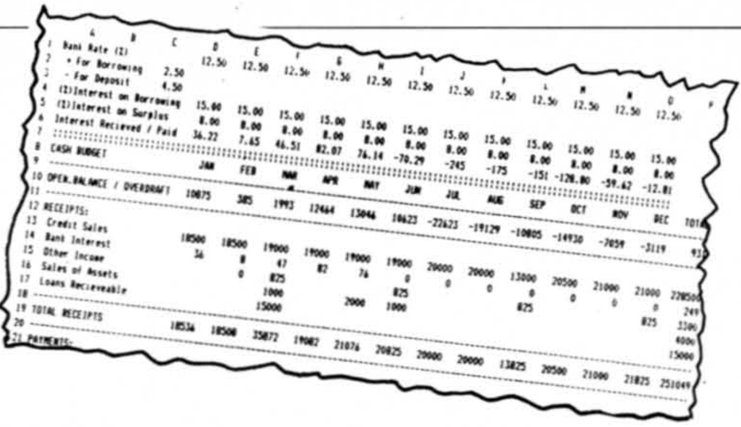
A powerful replication facility is available supporting both "absolute" and "relative" copying of formula over any "area" of the sheet.

Copying a formula from one cell to a whole area is simple and useful. Just place the cursor on the particular cell containing the formula and type //(area). In this case area means the cell references at the begining and end of the area into which the formula is to be copied.

An area begins at the left hand uppermost corner, and ends at the rightmost bottom corner, forming a rectangle.

Because of this feature, Ultracalc requires that even a single cell like A1 should be referred to as a rectangle named A1A1. A rectangle can therefore be a single cell, a row, a column, or any contiguous part of the page.

As well as copying the contents of a single cell into any area, Ultracalc also supports a powerful replication facility which can copy "relatively" or "absolutely" the contents of one area into another. The command for this is /R (source area) (target area).



```
     A              B     C     D      E      F      G      H      I      J      K      L      M      N      O      P
 1 Bank Rate (%)                12.50  12.50  12.50  12.50  12.50  12.50  12.50  12.50  12.50  12.50  12.50  12.50
 2  + For Borrowing 2.50
 3  - For Deposit   4.50
 4 (%)Interest on Borrowing     15.00  15.00  15.00  15.00  15.00  15.00  15.00  15.00  15.00  15.00  15.00  15.00
 5 (%)Interest on Surplus        8.00   8.00   8.00   8.00   8.00   8.00   8.00   8.00   8.00   8.00   8.00   8.00
 6 Interest Recieved / Paid     36.22   7.65  46.51  82.07  76.14 -70.29   -245   -175   -151 -128.80 -59.62 -12.81
 7 ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
 8 CASH BUDGET                    JAN    FEB    MAR    APR    MAY    JUN    JUL    AUG    SEP    OCT    NOV    DEC   TOT
 9 ---------------------------------------------------------------------------------------------------------------------
10 OPEN.BALANCE / OVERDRAFT     10875    385   1993  12464  13046  10623 -22623 -19129 -10805 -14930  -7059  -3119    93
11 ---------------------------------------------------------------------------------------------------------------------
12 RECEIPTS:
13 Credit Sales                 18500  18500  19000  19000  19000  19000  20000  20000  13000  20500  21000  21000 228500
14 Bank Interest                   36      8     47     82     76      0      0      0      0      0      0      0    249
15 Other Income                          0    825                  825                  825                  825   3300
16 Sales of Assets                           1000           2000   1000                                             4000
17 Loans Recieveable                        15000                                                                 15000
18 ---------------------------------------------------------------------------------------------------------------------
19 TOTAL RECEIPTS               18536  18508  35872  19082  21076  20825  20000  20000  13825  20500  21000  21825 251049
20 ---------------------------------------------------------------------------------------------------------------------
21 PAYMENTS-
```

The system incorporates an IF routine and a LOOK UP facility found only in expensive financial modelling packages running under CP/M or other operating systems.

IF allows the user to give conditional instructions, carried out only if defined conditions are met.

In LOOK UP, Ultracalc can look up an expression in any area instantly, without the user having to wade across the whole sheet searching.

These two facilities make it very versatile – almost in the class of Visicalc.

Rows and columns can be inserted/deleted simply by typing a single command. All the formulae and contents are automatically shifted and adjusted. Formatting the display is also simple and can be made applicable globally, or to individual cells.

For example, display of integers in those cells where necessary, and two decimal places in others can be achieved without fuss. "Labels" as well as "values" can be left or right justified.

In fact, all the formatting commands can be applied to a single cell or a whole area as necessary. While executing such a command, Ultracalc will automatically ignore blank cells, or cells containing "labels", if the command refers to "values" only.

Saving, loading, printing etc are carried out with ease, and all commands can be remembered easily. For example /S for SAVE, /L for LOAD and /P for PRINT.

Cassette and disc systems can both be supported, and I had no difficulty in using it with Amcom DFS in the extended mode.

Any part of the sheet can be saved or printed if it is defined by cell references as an "area". After saving, there is a command to verify whether the sheet has saved properly. If it has not, the screen will display "FAIL" so that the user can try again.

While printing it is possible to switch off the column and row scales, so they don't appear on the printed sheet.

By typing /T you can "fix" the area above and to the left of the cell bracketed by the cursor so that it remains in view when the cursor is moved to the right or towards the bottom of the screen.

This is useful in scrolling-in the contents of distant columns against the titles which are usually in the first left column.

The command /H will hold the contents of a cell, and will not allow the user to delete or overwrite it until /H command is issued again.

Ultracalc also allows the command /* which passes the rest of the line to the system, thus typing /*B. will take you to Basic, and /*. will give the catalogue of the current drive etc. Typing TOP will give the remaining memory and CNT counts the number of cells with values defined in them.

Memory is used like the precious thing it is. I built a simple model to calculate compound interest and total yield every year for 25 years for a given amount and rate of interest, the interest being compounded quarterly.

It used up only 5k, leaving more than 21k to be tapped. Obviously, much more complicated models can be built quite easily.

Calculation is also very fast. Any change in the given amount or interest rate in the above model recalculated the whole sheet in less than a second.

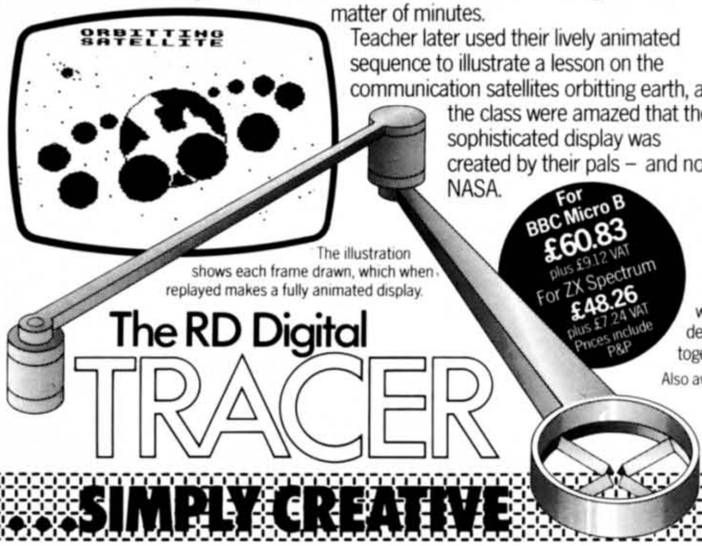
Obviously the program has been written by experienced and professional people reflected in every feature of it being simple and easy to use.

I could hardly find anything to complain about in Ultracalc. It has practically everything that a good spreadsheet should have, and I thoroughly recommend it to anyone who has to do a lot of financial modelling.

SCHOOLKIDS TRACE SATELLITE!

After the recent space shuttle flights the pupils of a Junior School were set the project – "Outer Space". In the computer room Jill, aged 9 and George, aged 10 were using an RD Digital TRACER on the BBC Micro to draw space monsters, following the simple commands for instant drawing and colour fill. They then added the animation routine, and imagine their excitement to see the monsters come to life and actually fly around the screen. Their teacher was impressed and could see a real life application. So he suggested that instead of monsters they draw a satellite in orbit. Using the special construction routines Jill and George did this in a matter of minutes.

Teacher later used their lively animated sequence to illustrate a lesson on the communication satellites orbitting earth, and the class were amazed that the sophisticated display was created by their pals – and not NASA.



The illustration shows each frame drawn, which when replayed makes a fully animated display.

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In the educational field the RD Digital TRACER is capable of very effective results in the most inexperienced hands, and yet it is an invaluable tool for the more advanced user.

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- Save displays on cassette or printer, or merge with your own programs.
- Uses all the BBC's graphics modes, including TELETEXT.
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For further details of the RD Digital TRACER either telephone or write to Dept. MU3 at the address below (SAE please). For prompt delivery, just send a cheque made payable to RD Laboratories Ltd., together with your name and address.

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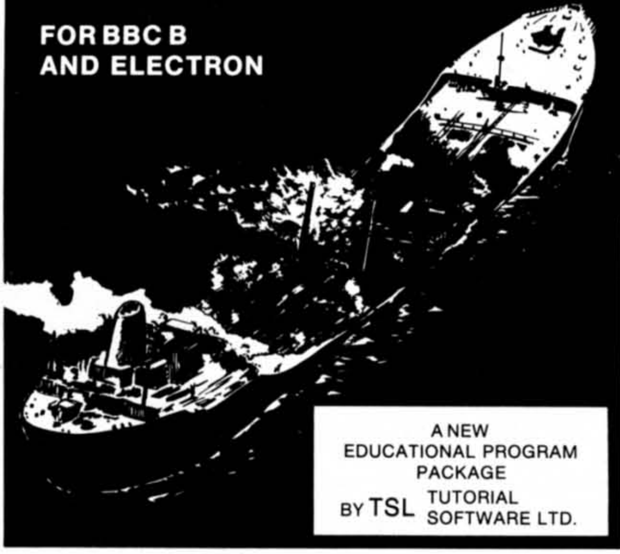

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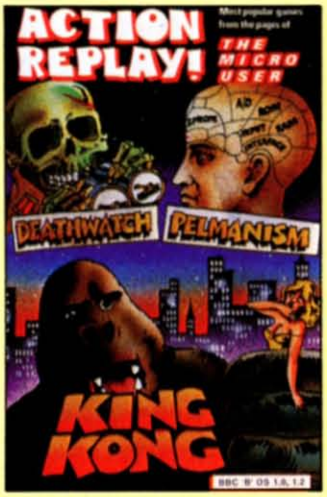
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PELMANISM
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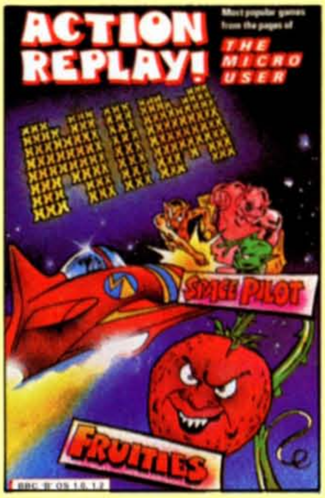
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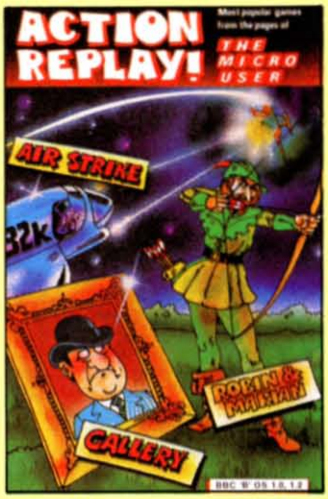
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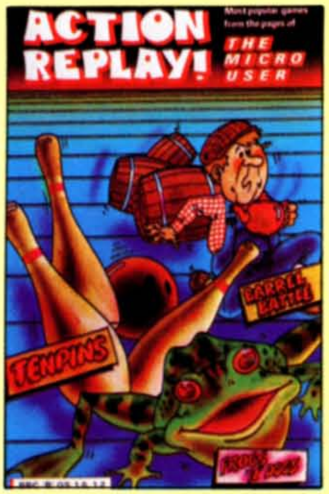
Robin and Marian Medieval melodrama! Rescue Maid Marian from the sheriff. A hilarious, action-packed game.

EECGAL In charge of the EEC's Picture Gallery, you have to put some order into the frames – but it's not so simple as it sounds.

Air Strike You need to fly fast and low for this dangerous intrusion into enemy air space.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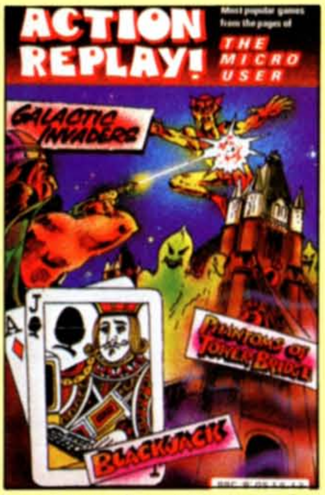
Barrel Battles Fast and furious video action. Dodging an avalanche of deadly barrels you climb towards the telephone.

Frogs 'n' Dogs Loved by young and old alike. Simply take Freddy Frog for a walk, avoiding Fido and poisonous lilies!

Tenpins Stunning simulation of ten pin bowling. This addictive game will hold you spellbound.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Tower of London Ghosts have broken out of the Tower of London and taken the treasure. Can you recover it?

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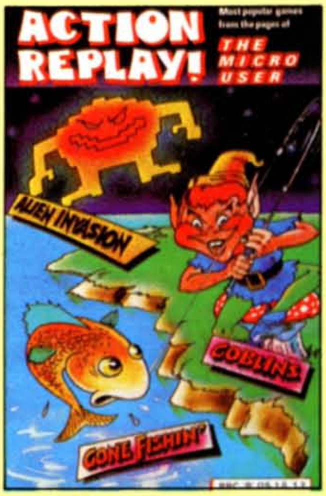
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Goblins Frolics in fairyland! Guide Kaplan the pixie home through the forests, avoiding the nasty goblins – a delightful game.

Gone Fishing Superb simulation of a day on the riverside. This enthralling program will give hours of enjoyment.

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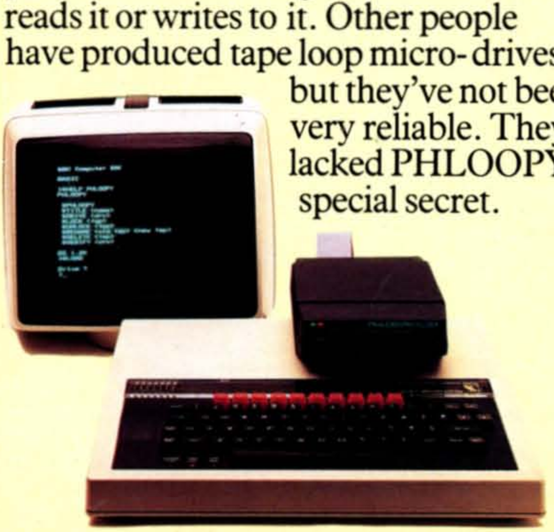
EUREK

A 100k BBC-drive for £99 + VAT

We've done it! We've built a mass storage system for your BBC Micro with the power and convenience of a floppy disk drive, but at a fraction the price. Get to know PHLOOPY, the remarkable new 100k drive that costs only £99 plus VAT, and a further £26 plus VAT for the interface to your BBC, operating system and connecting cables.

How PHLOOPY does it

PHLOOPY does not use disks to store data, but a 12-foot loop of professional-quality quarter-inch magnetic tape contained in a robust cartridge. The drive has only one moving part, the motor which drives the tape loop – hence the low price and high reliability. As the loop is driven round, each file of data it contains passes across the magnetic head which reads it or writes to it. Other people have produced tape loop micro-drives, but they've not been very reliable. They lacked PHLOOPY's special secret.



PHLOOPY's special secret

The heart of the invention is a brilliantly designed "byte-wide" magnetic head, made by Phi Magnetronics who build multi-track heads for professional use. PHLOOPY's head records and reads nine tracks across the width of a quarter-inch tape. That means the tape loop can be much shorter, so the typical time to access a file is reduced to a mere 3 seconds. If you're used to waiting for a cassette tape to trundle programs into your BBC, you'll be amazed at PHLOOPY's performance.

Getting it right every time

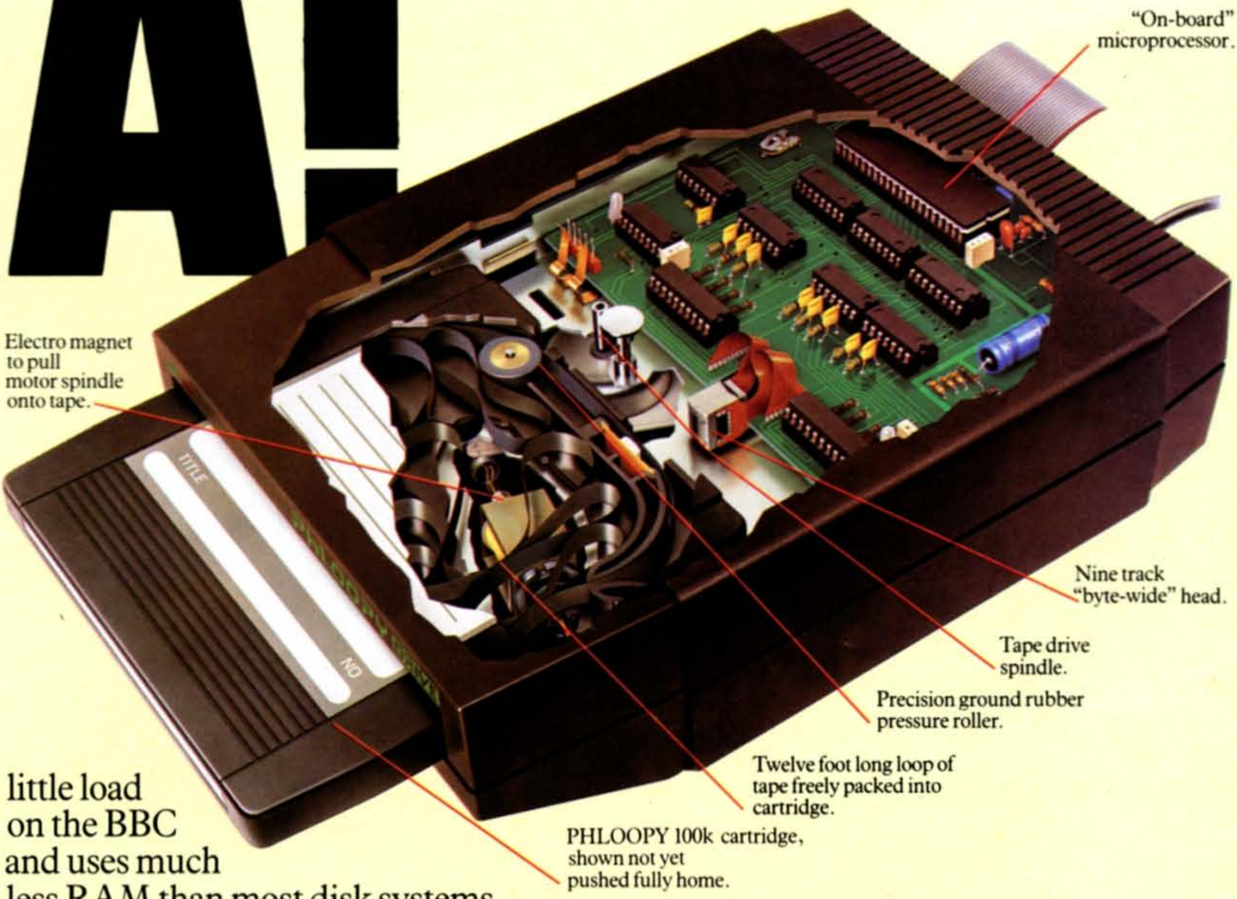
In addition, we've included a feature we know you will appreciate. PHLOOPY has full error detection and correction, so you can be certain you will get back what was originally written onto the tape.

Talking to your PHLOOPY

PHLOOPY's own software, contained in ROM, responds to standard BBC filing system and Basic commands. Most programs written to run on disk or cassette should run on PHLOOPY without problem.

And because PHLOOPY contains its own intelligent microprocessor – a second computer which does most of the hard work – PHLOOPY puts very

A!


"On-board" microprocessor.
Electro magnet to pull motor spindle onto tape.
TITLE
NO
PHLOOPY
Nine track "byte-wide" head.
Tape drive spindle.
Precision ground rubber pressure roller.
Twelve foot long loop of tape freely packed into cartridge.
PHLOOPY 100k cartridge, shown not yet pushed fully home.

little load on the BBC and uses much less RAM than most disk systems.

Installing PHLOOPY on your BBC

You'll be amazed how simple it is to install PHLOOPY. Just plug in the interface cut two resistors (clearly marked in the instructions) and the job is done. If you should have problems our engineers are waiting to help you.

Making a PHLOOPY Library

PHLOOPY cartridges hold a full 100k of data or programs. Two of them come free with the drive and extra ones cost £3.75 each plus VAT. They are moulded of high impact polymers for protection and store easily on a bookshelf. Many programs will be available to purchase on PHLOOPY.

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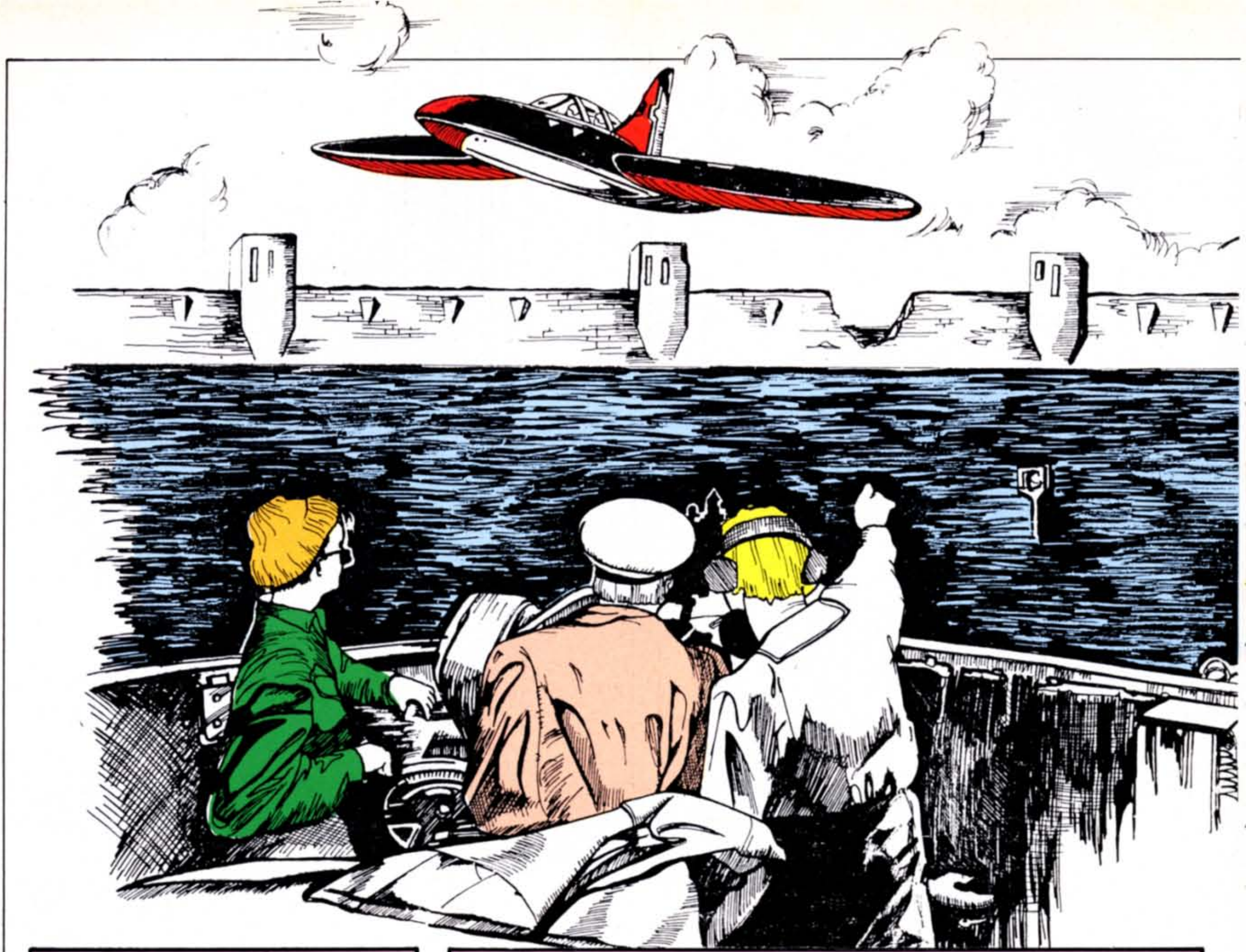


MAIN VARIABLES

Arrays

D%( )	Negative inkey values of function keys.
H%( )	High scores.
N$( )	High score names.

Variables

H%	Number of hits on ship.
SC%	Score.
BN%	Bonus
N$	Player's name.

The folowing variables are used to indicate if a movable object is on the screen:

M%	Missile.
P%	Plane.
B%	Bomb.
T%	Torpedo.
U%	Submarine.
D%	Depth charge.

The following variables are the X Y coordinates of the movable objects:

SX%	Ship.
PX%,PY%	Plane.
BX%,BY%	Bomb.
UX%,UY%	Submarine.
TX%,TY%	Torpedo.
DX%,DY%	Depth charge.
SL%	Sea level.
NL%	New sea level.
BL%	Bricks left in wall.

CONTROLS

Z	Move ship left
X	Move ship right
Space bar	Fire missile
<	Guide missile left
>	Guide missile right
f0 to f9	Release depth charge to explode at preset depth. f0 is minimum depth. f9 is maximum depth.

PROCEDURES

PROCtitles	Displays program titles.
PROCinstructions	Displays game instructions.
PROCinitialise	Initialises all variables.
PROCscreen	Sets up screen display.
PROCmainloop	Forms the mainloop of the game and embodies all the following procedures.
PROCscore	Updates and displays current score.
PROCboat	Moves the boat.
PROCmissile	Fires the boat's missiles.
PROCplanes	Moves the attacking planes.
PROCbomb	Drops the planes bombs over the ship or the dam.
PROCsea	Changes sea level as the dam is destroyed.
PROCsub	Moves the submarine.
PROCtorpedo	Fires torpedoes from submarine.
PROCdepth	Drops depth charges from ship.
PROChit	Checks if ship is hit by bomb.
PROCbrick	Removes bricks from dam.
PROCexplode	Explodes depth charge and checks if submarine is hit.
PROCend	Terminates the game if the ship is hit three times.
PROChighscore	Maintains a table of high scores.

Defend the dam in this all-action blockbuster by GEOFF TURNER

DAMRAIDERS

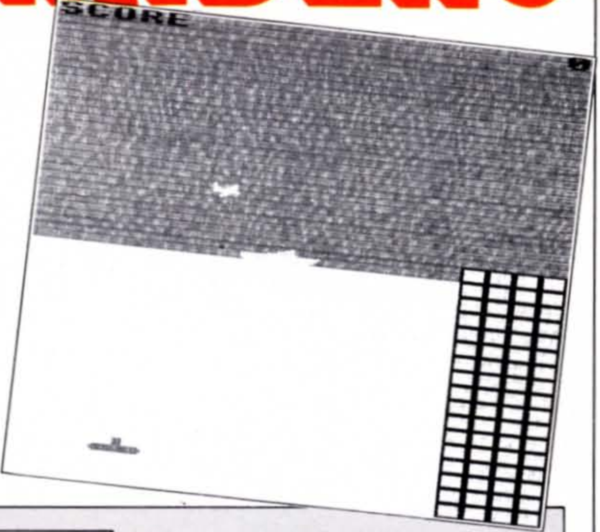
IN COMMAND of a Royal Navy frigate, your orders are to defend a dam under constant attack from enemy aircraft and submarines.

The planes drop bombs both on your ship and the dam, while the submarines attack the dam with torpedoes.

You can counter-attack with guided missiles and depth charges, but as the dam is damaged the water level falls. Your ship will eventually be destroyed when it reaches the bottom.

Also three hits from bombs are enough to sink your vessel.

You score 50 points for each plane and 100 for each submarine, scoring 10 points for each brick left in the dam at the end.



```
 10 REM DAMRAIDERS
 20 REM By Geoff Turner 1984
 30 ON ERROR GOTO 2820
 40 *TV255
 50 MODE 2
 60 PROCtitles
 70 MODE 7
 80 PROCinstructions
 90 DIM D%(11),H%(6),N$(6)
100 FOR I=1 TO 6
    :H%(I)=0
    :NEXT
110 PROCinitialise
120 MODE 2
130 PROCscreen
140 REPEAT
150 PROCmainloop
160 UNTIL H%=3
170 PROCend
180 MODE 7
190 PRINT TAB(0,10);"YOUR SCORE "
    ,SC%
200 PRINT TAB(0,11);"BONUS      "
    ,BN%
210 PRINT TAB(0,12);"TOTAL      "
    ,SC%+BN%
220 PRINT
    :PRINT
    :PRINT :
230 *FX15,1
240 INPUT "Enter your name ",N$
250 PROChighscore
260 CLS
270 GOTO 110
280 DEF PROCtitles
```

This listing was produced using a special formatter which breaks one program line over several lines of listing. When entering a line don't press Return until you come to the next line number. Full details of the formatter are in the July 1983 issue of The Micro User.

```
290 VDU 5
300 MOVE 350,600
310 GCOL 0,1
    :PRINT "DAMRAIDER"
320 MOVE 342,592
330 GCOL 0,6
    :PRINT "DAMRAIDER"
340 MOVE 150,400
350 GCOL 0,1
    :PRINT "By Geoff Turner"
360 MOVE 142,392
370 GCOL 0,6
    :PRINT "By Geoff Turner"
380 TIME =0
    :REPEAT UNTIL TIME >500
390 ENDPROC
400 DEF PROCinstructions
410 PRINT CHR$ (141);TAB(13,0);"DAMRA
    IDER"
420 PRINT CHR$ (141);TAB(13,1);"DAMRA
    IDER"
430 PRINT
440 PRINT "YOU ARE IN COMMAND OF
     A ROYAL NAVY"
450 PRINT "FRIGATE. YOUR ORDERS ARE
     TO DEFEND A DAM";
460 PRINT "WHICH IS UNDER CONSTANT
     ATTACK BY ENEMY"
470 PRINT "AIRCRAFT AND SUBMARINES."
480 PRINT
490 PRINT "THE PLANES DROP BOMBS
     ON YOUR SHIP AND"
500 PRINT "THE DAM WHILST THE SUBMARI
    NES ATTACK"
510 PRINT "WITH TORPEDOES."
520 PRINT
530 PRINT "YOU MAY COUNTER ATTACK
     WITH GUIDED"
540 PRINT "MISSILES AND DEPTH CHARGES
    , BUT AS"
550 PRINT "THE DAM IS DAMAGED, THE
     WATER LEVEL"
560 PRINT "FALLS AND YOUR SHIP WILL
     EVENTUALLY"
570 PRINT "BE DESTROYED WHEN IT REACH
    ES THE BOTTOM."
580 PRINT
590 PRINT "IF YOUR SHIP IS HIT BY
     3 BOMBS IT WILL"
600 PRINT "BE DESTROYED"
610 PRINT
620 PRINT "PRESS SPACE BAR"
630 REPEAT UNTIL INKEY (-99)
640 REPEAT UNTIL NOT INKEY (-99)
650 CLS
660 PRINT CHR$ (141);TAB(10,0)"POINTS
    "
670 PRINT CHR$ (141);TAB(10,1)"POINTS
    "
```

Listing continues on Page 201

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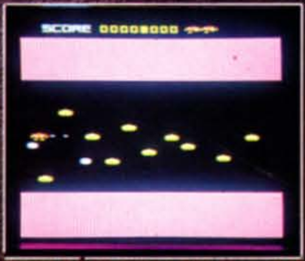
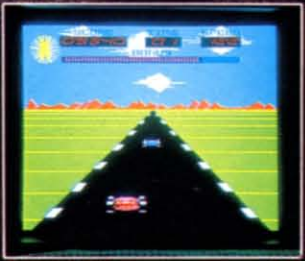
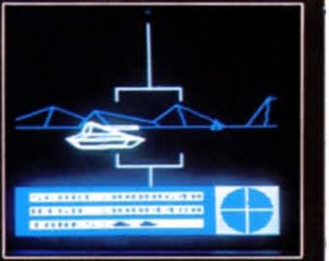


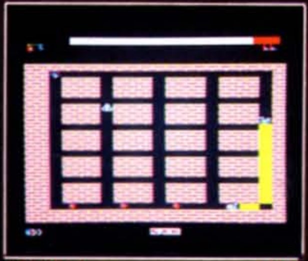
BORIS IN THE UNDERWORLD (32K) £7.95
A novel arcade-style game in which you take the part of Boris, who has had his home raided by the underworld creatures. They have stolen most of your possessions and your task is to venture into the underworld to retrieve your valuables by fighting off the underworld creatures. The walls of the underworld close in and you will be vapourised if they touch you. Can you retrieve all of Boris's possessions from the underworld?
•••NEW RELEASE•••



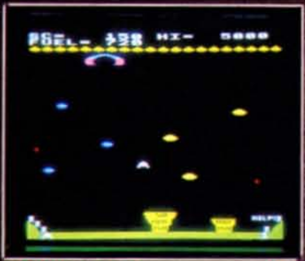
OVERDRIVE (32K) £7.95
A highly-addictive multi-stage 3D race game. You steer your car left and right, accelerate and decelerate as the opposing cars weave about the road. There are five different stages including night, snow, desert, and riverside scenes. Incredible graphics give the impression that you really are taking part in the race. Highly recommended, and destined to become another top-seller for Superior Software.
•••NEW RELEASE•••



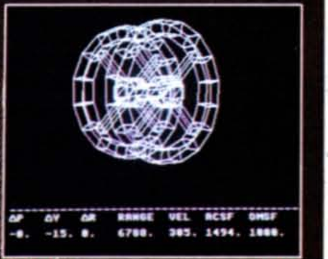
BATTLETANK (32K) £7.95
An excellent game, made possible on the BBC computer only by the unique use of a dual-screen display and specially written plotting routines. You are a tank gunner looking out onto a mountain plateau. You see the distant mountains and the pyramid obstacles – and also the enemy tank. Position the tank in the rectangular viewfinder by fine adjustments of your controls...then fire!
(KEYBOARD or JOYSTICKS).
•••NEW RELEASE•••



ROCKY (32K) £7.95
A new concept in arcade-style games. Your task is to save yourself from patrols of mutant robots by dropping rocks on them. Each of the robots has a single large eye which emits a yellow beam of light. Being caught in this beam reduces your strength and, if you are not carrying a rock, causes the robot to metamorphose. It may change into either a spectre or a cruncher.
(KEYBOARD or JOYSTICKS)
•••NEW RELEASE•••



MOON MISSION (32K) £7.95
Moon Mission is a fast-action machine-code game featuring superb graphics, sound effects, hi-score, and rankings. Your mission is to rescue the six astronauts stranded on the moon by steering your spaceship through the meteors and space-mines. The game starts relatively slowly, but from sheet to sheet not only does the speed increase, but also the number of meteors, space-mines, enemy spaceships, and fireballs.
•••NEW RELEASE•••



2002 (32K) £7.95
A space docking simulator using 3D graphics to model the motions and responses of the ORION 4 spacecraft. Your mission is to pilot the shuttle to a "soft dock" with the space station. PITCH, YAW, ROLL, FORWARD, LATERAL and VERTICAL engines are provided together with orbit manoeuvering booster engines. 6 skill levels provide for the completely inexperienced pilot as well as the fully-fledged commander.

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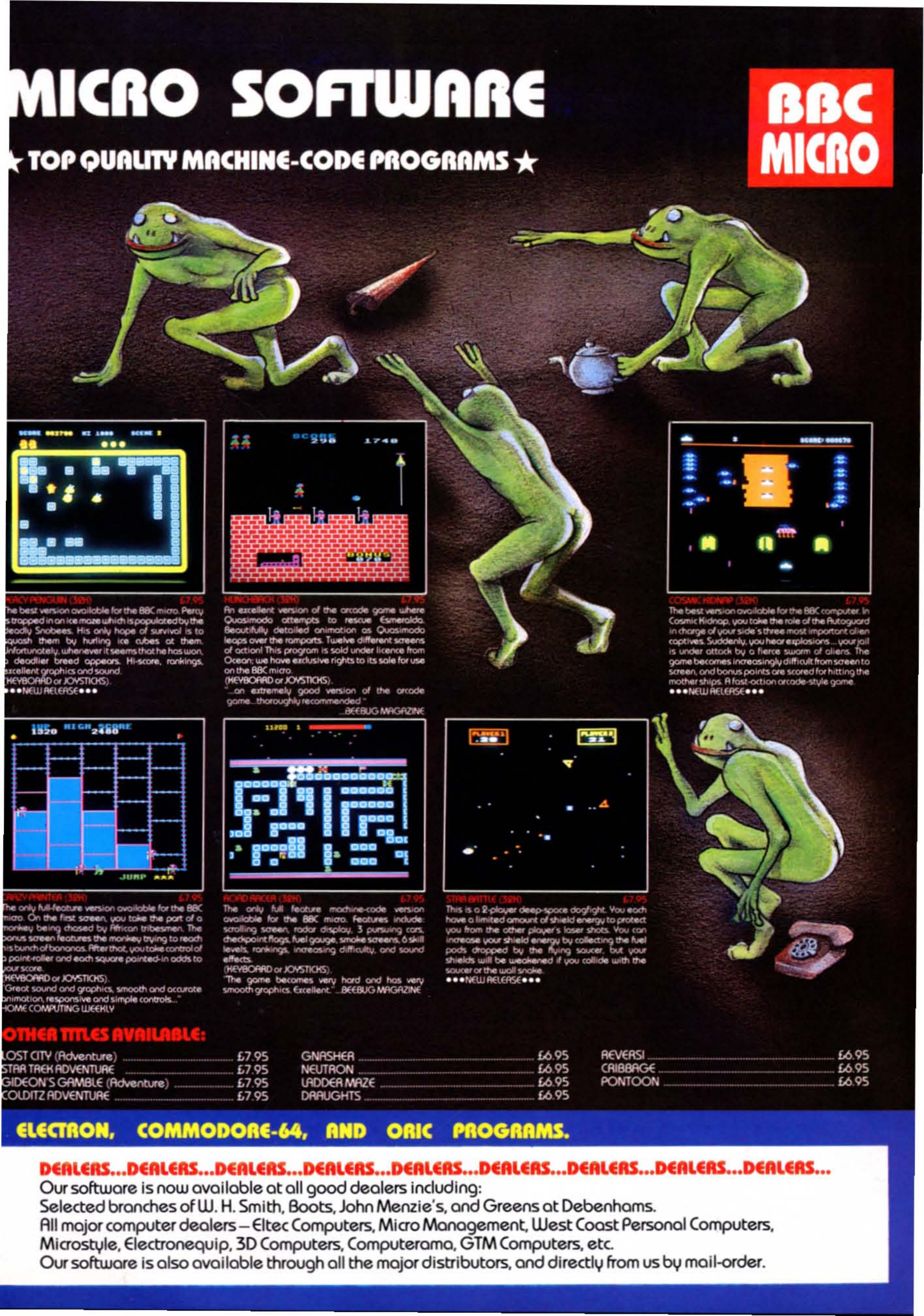

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he best version available for the BBC micro. Percy s trapped in an ice maze which is populated by the eadly Snobees. His only hope of survival is to quash them by hurling ice cubes at them. Unfortunately, whenever it seems that he has won, deadlier breed appears. Hi-score, rankings, xcellent graphics and sound.
KEYBOARD or JOYSTICKS).
•••NEW RELEASE•••

HUNCHBACK (32K) £7.95
An excellent version of the arcade game where Quasimodo attempts to rescue Esmeralda. Beautifully detailed animation as Quasimodo leaps over the ramparts. Twelve different screens of action! This program is sold under licence from Ocean; we have exclusive rights to its sale for use on the BBC micro.
(KEYBOARD or JOYSTICKS).
"...an extremely good version of the arcade game...thoroughly recommended."
...BEEBUG MAGAZINE

COSMIC KIDNAP (32K) £7.95
The best version available for the BBC computer. In Cosmic Kidnap, you take the role of the Autoguard in charge of your side's three most important alien captives. Suddenly, you hear explosions... your jail is under attack by a fierce swarm of aliens. The game becomes increasingly difficult from screen to screen, and bonus points are scored for hitting the mother ships. A fast-action arcade-style game.
•••NEW RELEASE•••

RAZY PAINTER (32K) £7.95
he only full-feature version available for the BBC micro. On the first screen, you take the part of a monkey being chased by African tribesmen. The onus screen features the monkey trying to reach is bunch of bananas. After that, you take control of paint-roller and each square painted-in adds to our score.
KEYBOARD or JOYSTICKS).
"Great sound and graphics, smooth and accurate nimation, responsive and simple controls..."
HOME COMPUTING WEEKLY

ROAD RACER (32K) £7.95
The only full feature machine-code version available for the BBC micro. Features include: scrolling screen, radar display, 3 pursuing cars, checkpoint flags, fuel gauge, smoke screens, 6 skill levels, rankings, increasing difficulty, and sound effects.
(KEYBOARD or JOYSTICKS).
"The game becomes very hard and has very smooth graphics. Excellent." ...BEEBUG MAGAZINE

STAR BATTLE (32K) £7.95
This is a 2-player deep-space dogfight. You each have a limited amount of shield energy to protect you from the other player's laser shots. You can increase your shield energy by collecting the fuel pods dropped by the flying saucer, but your shields will be weakened if you collide with the saucer or the wall snake.
•••NEW RELEASE•••

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The interface joins together the analogue and the user ports to use the full keypads giving a total of 24 user definable keys. The interface can also be used as a splitter for the A/D port to take two items at the same time, e.g. joystick and lightpen.

DELTA DRIVER on cassette or disc: Two programs on each cassette or disc. One converts machine code programs from the keyboard to the joystick or keypad, with adjustable sensitivity on the joystick and will run on any O.S. The second program (needs O.S. 1.0 or later and an interface) duplicates any keyboard keys on the keypads, in the operating system, so that it can become a numeric keypad or will take on the function keys.

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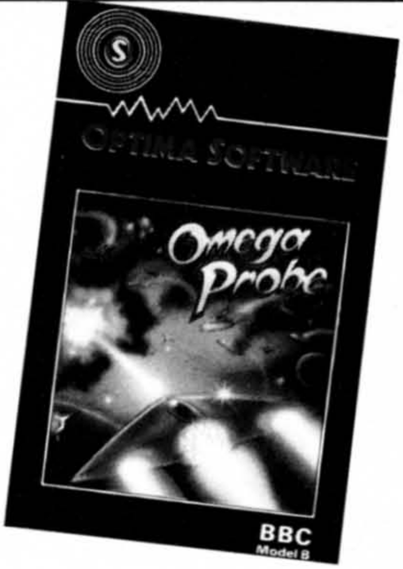


IF you have a fatal fascination for unsolved mysteries and unexplored territories, then participating in Optima's *Omega Probe* may just be the sort of program for you.

Little is known about the Omega Zone except that it lies in the uncharted reaches of the universe, a place from where no man has ever returned alive.

Your mission is quite simply to survive, travelling in the ultimate spacecraft – Omega Probe.

Deep space may not be a terribly new or innovative setting, but the story the game depicts does conjure up a sense of foreboding and excitement.

I was especially impressed by the way in which it is brought to life on screen by quite splendid colour and animation.

The many hazards encountered by Omega Probe are cleverly displayed by the use of three separate layers of objects all moving simultaneously.

This not only produces one of the fastest machine code games that I have seen, but gives the game an almost 3D effect.

While the controls of the game are fairly simple (comprising four way movement and a fire button), Optima have included some ingenious refinements.

There are the usual facilities for choosing to play with or without sound and with or without a joystick, as well as a pause option for freezing the game at whatever stage is wished.

The ingenuity arises in that these options can be selected at any time without recourse to the original menu.

Indeed, you can even change options while in the pause mode, not only giving you more time to think, but further enabling you to continue the mission where you left off.

A very simple but nevertheless effective extra is the two keyboard option for controls.

Omega Probe is a must for all game fanatics. It is not just another watered-down version of an arcade game, but a truly original, fast-moving and action-packed game that rivals even the best of arcade game classics.

Karen Torevell

Egged on by the Chickaroo

NOT being too keen on birds, children's word games or space invaders, I approached **Chickaroo** by Screenplay with hesitation. I was, however, pleasantly surprised.

The game turned out to be quite an acceptable combination of all three, the star attraction being a bird named Chickaroo.

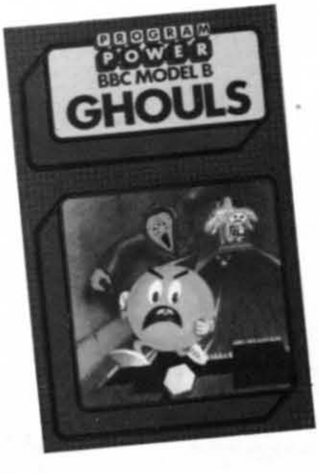
It flies across the screen laying eggs as it goes. Each egg holds a letter which can only be revealed by shooting at it.

If you think that the revealed letter fits an incomplete word shown on screen you send another little bird to collect it. Err and you will be exterminated.

This certainly took the boredom for me out of yet another word recognition game. Children too, I'm sure, will be much more willing to play along with

→

ADDICTED TO BEING EATEN . . .



AFTER numerous fruitless attempts to retrieve stolen power jewels, being continually and mercilessly eaten alive by spiders and dropped through broken floorboards, I feel that I am well-justified in describing **Ghoul** as addictive.

I now fill the top ten scores for today (under a variety of pseudonyms) and have still not progressed past the second sheet.

As you will by now realise, one of the great attractions(?) of this game from Program Power is that it cannot be mastered in a couple of minutes.

The scene is set in a deadly haunted mansion and your task is to rescue power jewels from the mischievous ghosts that stole them.

If you can perfect the knack of leaping over cracked floorboards and deadly spikes you are faced by moving platforms.

Throughout the game you are pursued by the ever-lurking spooky ghost. (He seems to crop up everywhere – especially when you are nearing the jewels.)

I very much like the idea of having to watch out for a multitude of hazards and enemies with only a few controls at one's disposal.

No, I'm not a masochist. It's just refreshing to be able to play a game almost straightaway without having first to digest a lengthy and complicated list of instructions and controls.

You do have a power pill which disables the ghost for a short while, but otherwise it's all down to coordination and dexterity in running and jumping out of harm's way. This requires practice and a great deal of patience.

The game is visually successful in creating a spooky setting, and choosing to play with sound effects only enhances the atmosphere.

Ghoul is simple but effective. Now I really must go and have one last stab at retrieving those jewels . . .

Karen Torevell

From Page 87

their parents' wishes for them to learn.

The game involves very attractive use of colour as well as realistic space invader sound effects, providing the sense of urgency and danger that is always attractive to the young.

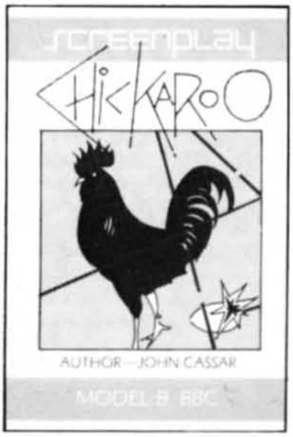
It really is a case of "Bang, bang you're dead" if you fail to recognise a word correctly.

As well as the 100 words provided in two data files, the menu allows the setting up of an alternative file of up to 50 words.

Such a facility improves the game's otherwise fairly limited educational usefulness.

According to Screenplay, certain of the words in the data file are chosen so that the spelling of other words will be encouraged while guessing for the correct one.

For example, the possibilities for completing the word "IN" are many. This may in theory be a good idea, but I found it most disconcerting to be "killed off" for making up the word FIN instead of WIN.



OK, so maybe I was trying to be clever (and there's nothing like an educational game aimed at children for boosting the confidence) but surely this is rough justice.

I found the word skills required to be pretty basic. It is obviously designed for the very young.

The game claims nothing more, however, than to help develop word recognition skills in children.

Chickaroo not only achieves this, but I'm sure also retains the attention of its pupils well beyond the scope of the average teacher.

Patricia Trickett

FRANKLIN'S TOMB
GSH
Salamander
SOFTWARE

Adventures can be fun

FRANKLINS Tomb is the first in a trilogy of adventures for the Beeb from Salamander.

It is very attractively packaged, and has an excellent manual, with drawings of some of the locations, as well as the instructions.

You are Dan Diamond, a private eye full of witticisms like "You got a light Mac?" I asked.

"No, but I got a dark brown overcoat", he replied.

You receive an unsigned letter. Inside is an address, and a message: "Please come, you're our only hope".

On arrival, you trigger a mechanism, and find yourself falling. Suddenly you are in Franklin's Tomb, and the adventure begins.

The screen is split into three different coloured sections.

One section gives a description of your surroundings, another lists your possessions and the last is for commands, computer response and articles to be found as you enter a location.

The response to commands is very fast, and it is possible to stack up commands, a feature that I always really appreciate.

The program recognised most of the traditional keywords, although some of the responses were not quite what I expected.

For instance, its response to "Wave rod", was, "OK, but no-one waves back!" – a sense of humour yet!

Unfortunately, the content does not live up to the presentation.

The problems in the adventure are reasonably easy to solve. In fact the real problem lies in trying to keep one eye on the description at the top of the screen, and the other on the bottom, for any articles or treasure present.

There is a rather elusive rabbit walking around this program and I kept missing him because I was too busy watching the top of the screen.

After discounting the normal keywords for movement, getting and dropping, there are about 30 verbs you can use. Most of these can be deduced from room descriptions, and the drawings in the manual.

I also found the variety of colour on the screen to be very tiring, and I would have liked a command enabling you to turn it off.

Overall, a nicely packaged program, but definitely not for the more experienced adventurer.

I find the idea of a trilogy of adventures very exciting. I just hope the other two programs are a little more demanding.

And please! Don't program "Beeps" into the keys! The wife keeps coming in at 3am and saying: "Right! That's more than enough out of you for tonight.

"Time for bed!"

Paul Gardener

QUICK RUNS

A first look at some of the latest releases

Escape: *You are a member of a group of prisoners who have managed to dig a tunnel to freedom from their hut. Three prisoners are chosen to try out the escape route. Each must try to dodge the guards, dogs, machine guns and cross the minefields. The final stage, if you're still alive, is to find the station and catch a train to Switzerland.* (Warex Soft)

★ ★ ★

Keyboards: *A set of keyboard programs for use either on their own or within your own programs. The menu includes a simple three voice organ in Basic, a single voice organ with pitch bend and two chord organ programs.* (Musicsoft)

★ ★ ★

Fortress: *Pilot of a starfighter flying over enemy defences, your mission is to destroy enemy HQ with four direct hits, being careful to avoid rockets and having to negotiate walls and force fields. Gun turrets and enemy planes are ready to fire at you if you find yourself in line with them. Your task is not made any easier by your diminishing fuel supply which can only be replenished by destroying enemy fuel barrels. The game incorporates quite stunning graphics.* (Pace)

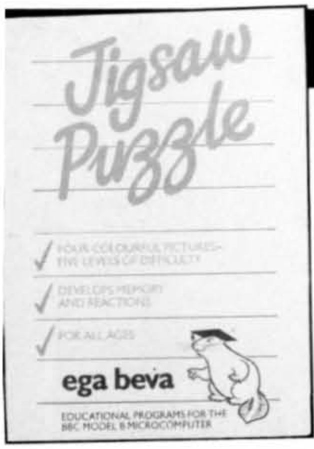
★ ★ ★

Word Sequencing: *A series of jumbled words must be arranged to form either a proverb, rhyme, or sensible sentence. Identify the words using the cursor keys and reposition them using the function keys.* (Acornsoft)

★ ★ ★

Cottage Software: *This has four levels aimed at 4-5 year olds. Counting – Level 1 features spacebar counting exercises with hi-res graphics. Up to five random silhouettes appear in line which must be counted using the key. On each count the figure is detailed and coloured. A wrong count produces failure. 10 screens.*

Counting – Level 3 features numeric or


Jigsaw Puzzle
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FOR ALL AGES
ega beva
EDUCATIONAL PROGRAMS FOR THE BBC MODEL B MICROCOMPUTER

Jigsaw jogs the memory

HAVING always been a sucker for the endearing nature of animals, I was instantly attracted by the very appealing ega beva software package, **Jigsaw Puzzle.**

It is one of those strange quirks of nature that many of us, myself included, are much more willing to learn from a cute little beaver in a mortar board than a stern old professor (or even, dare I say it, a computer).

Education authorities take heed!

At least the beaver had gained my initial attention, but would it last?

Having already played on the more sentimental side of my character I somehow knew I would have to succumb.

Jigsaw Puzzle is a beautifully colourful game to test your memory skills, whatever your age.

The object is to reconstruct a picture split up into sections shuffled about, the number of sections varying according to the chosen level of difficulty.

Each section has a letter corresponding to it, so to move piece A to the position occupied by piece F, for example, you just press A and then F on the keyboard. What could be simpler?

And when you tire of looking at one picture there are three other equally appealing ones to choose from.

The similar **Sliding Block Puzzle** differs only in that one of the sections is missing.

The idea is to reconstruct the jumbled picture by sliding the blocks around the screen, one at a time and only into the blank space.

What's needed here is co-ordination and patience.

What is so special about two versions of what really are games based on quite an old theme?

In short, the presentation and illustration is excellent. And besides, the good old jigsaw will never go out of fashion. It has been around much longer than Space Invaders!

If I do find fault with either of these puzzles it is in the length of time that it takes for the pictures to reveal themselves.

In this case, however, to quote a very old saying, patience is a virtue!

Karen Torevell

Love and marriage...

ACORNSOFT/Ivan Berg Software have produced two, similar looking packages to help you decide whether you really do hate the sight of your marriage partner or whether it's just an illusion you've been having.

ACORNSOFT IVAN BERG SOFTWARE
HANS J EYSENCK
..I Do'
YOUR GUIDE TO A HAPPY MARRIAGE
The Program
for the BBC Microcomputer and Acorn Electron

Both packages are designed to run on the BBC Micro and the Electron.

The Dating Game by Dr Glenn Wilson and **...I Do** by Hans J. Eysenck (of "Test Your Own IQ" fame) each contain two cassettes and instruction booklet.

They are both good games, handy for provoking conversation, but hardly designed to change your life.

I remember, as a teenager, avidly doing the quizzes in "Jackie" to rate my chances in love and marriage, and these packages pander to exactly those same impulses.

You are sure your innermost self will stand revealed to you, and it's always a bit of a letdown to find nothing very exciting after all.

Eysenck's "... I Do" is a real old psychological test in the true spirit of these things.

He makes sure you don't cheat by asking you the same thing three different ways, and words the questions as though we've all had Mensa membership since we were in nappies.

The results are displayed as positions on eight different sliding scales.

However the labels used at each end of the scales have a high jargon factor, so that when you finally get your score, it is not all that clear what it means.

The scales include:
Extraversion – Intraversion
Psychoticism – Superego
Tender minded – Tough minded
High libido – Low libido

You can see that these are supposed to tap your personality and attitudes, but just where that gets you in relation to your partner is another matter.

The handbook suggests the test be used in the spirit of "Know Thyself", though if you don't already know the things it tells you, you are probably beyond redemption!

However you might just learn some unknown quirks of your other half.

Glenn Wilson's The Dating Game, although similar in its basic concept, is designed with greater imagination and even a sense of humour and proportion.

Incidentally, when you enter your personal details you'll need

→

function key counting of detailed characters placed on screen at random. Once again a wrong entry results in failure. In both programs a successful entry results in a pleasant smile from a jovial face.

★ ★ ★

Missing Signs: *Three separate Maths programs. 1. Identify missing signs (+ – * /) to make selected calculations correct. 2. Identify missing signs (< = >) to balance out two equations involving (+ –). 3. As number 2 but for equations using (* /). All menu operated with selectable difficulty.* (Acornsoft)

★ ★ ★

Amazing Ollie: *Move Ollie round different mazes in four separate games. First you find fish and deliver them, then play at counting them. Run against the clock in the third or play blind in the last.* (Storm)

★ ★ ★

Dodgy Dealer: *Boss of a small manufacturing business, your aim is to secure the largest possible average yearly profit. How should you invest your initial £5,000 and how much should your product sell for? You may call upon reports from your departments or even pay for some expert advice, but at the end of the day the decisions you make are yours alone.* (Wright & Stradling)

★ ★ ★

Eagle: *Guide your Eagle spacecraft through the caves and tunnels of the four moons of Thrug, collecting iridium pods, avoiding hazards and conserving energy. Each moon has five different screens bristling with hazards.* (Salamander)

★ ★ ★

Paras: *A strategy war game simulating a force of 15 men under your command whose task is to break the enemy's communications. Two separate scenarios create the action. Position your men and weapons on the grid squares as you try to destroy the bridge.* (Lothlorien)

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to lie about your age if you are under 16 or the program will hang up on you.

Mr Wilson has a more relevant approach than Eysenck. The questions seem quite realistic and meaningful and on the whole it is less obvious which is the "right" answer.

The first cassette contains just the one questionnaire, "The Dating Game", which can be played by up to 40 people.

They can each be tested against each other for compatability (platonic or sexual).

The scope this gives for engendering daftness at parties is obviously a point in its favour.

The second cassette contains several smaller and less well-constructed "games". Love Style characterises you as fanciful or practical, cool or passionate, serious or playful and so on.

Other tests investigate your Preferred Relationship and assess your Dating Skills.

Really both packages should be marked "Strictly For Fun". To pretend greater things for them (as Eysenck does) is really rather pompous and ridiculous.

However if you do take them in a spirit of jollity they are both quite entertaining.

The . . . I Do quizzes will seem rather uninspiring to old hands, but if you've never done anything like them before they will pass muster.

The Dating Game is more readily comprehensible in both questions and results, its approach more refreshing, and its sense of its own importance more realistic.

For example, if you score low on your dating skills it will advise you: "Seek help immediately or become a hermit".

Wendy Cook

The Hunchback's castellations really get you

SUPERIOR SOFTWARE
HUNCHBACK
FOR THE 32K BBC MICROCOMPUTER

IT is not often that a piece of software changes your life, let alone a game. However having been exposed to **Hunchback,** I am sure my life will never be the same for a long time.

For the last six months, first thing every morning, my young son Alec (two at the moment) has demanded: "See little man", and nothing will suffice but we load up Hunchback and send a score of little men plunging to their deaths.

The fact that this is not the object of the game doesn't seem to bother him. The excellent sound and graphics hold his attention and bring out gales of laughter as if he were being tickled.

That notwithstanding the Superior Software offering is a very good game. The object is to rescue Esmeralda, who is captive in a tower.

Before you reach her you have to run along the battlements avoiding the castle's formidable defences.

You have three controls "Run left", "Run right" and "Jump" which can be operated from the keyboard or from a joystick.

There are 12 screens, each containing a different combination of hazards.

The game starts with your "little man" at one end of a wall and a bell with a long rope attached at the other.

As you make your first strides towards the bell a rasping thud rings out and a cannon ball flies towards you.

Judging the correct moment to jump over it is not so tricky and is rewarded with a very satisfying exuberant "weeeee" noise.

However if the cannon ball so much as clips you, you plummet off the wall with an elongated "arrrrr" noise.

When you reach the rope you grab it and the bell rings, then the screen scrolls lumpily sideways to the next section of the wall.

This reveals a large chasm with a swinging rope. You have to judge your run and jump very finely to grab the rope and swing across.

Next you face a series of castellations in the battlements which you have to leap over. In the next wall the castellations are filled with guards raising and lowering their spears.

No prizes for guessing where they get your "little man" as he leaps over them.

The remaining walls consist of a mixture of these hazards with cannon balls and arrows coming from both directions and varying heights.

The final wall throws the lot at you with Esmeralda waiting at the top of the final rope. Having never got through the final wall I can't tell you what happens when you reach it.

To allow you to keep track of your progress there is an insert showing your overall position and distance from Esmeralda.

The scoring is simple. For each section of wall there is a bonus score that keeps ticking away, the longer you take to complete a wall the lower your score.

The usual high score table keeps track of the best score.

You can play the game at three levels of difficulty which mainly affect the speed of the action. There is also a special feature to allow you to practise on any of the wall sections, which is useful as it allowed me to see what the further wall sections looked like.

All in all, this game has excellent graphics and sound blended in a way that is remarkably good.

It has a good addiction factor and is fun into the bargain. As Alec puts it: "See little man AGAIN"!

Mike Cook

Easy crasher

BBC MICRO
UTILITIES PACKAGE
SOUND SHAPER
EDG EPSON SCREEN DUMP
EDG TELETEXT SCREEN EDITOR
DISASSEMBLER
Salamander SOFTWARE

UTILITIES Package from Salamander features a Teletext designer, a sound/envelope designer, a disassembler and an Epson screen dump.

The software came on tape and has a 23 page booklet explaining the programs.

The first program is Sound Shaper. The complexities of the sound chip and its associated commands have always been a mystery to me, and after this will probably remain so.

I managed to crash the sound

→

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definer after three key presses but perseverence got me some exotic effects.

I didn't like the way that the program broke so easily, although you could blame it all on user incompetence. But shouldn't the program and the manual avoid such problems?

The Epson screen dump has a few nice ideas but the results aren't all that good. So on to the next program, which to my mind is the best of the set.

TText is a Teletext screen editor that allows the design of Mode 7 screens. It has many excellent features and is a joy to use.

The only problem is that it lacks a few capabilities that I'm sure could be easily added.

The screen has a current state line at the bottom which gives information about x, y position, whether you are in graphics mode or not and a double height indicator.

Best of all, it tells you the otherwise invisible Teletext control characters present as you move the cursor over them.

The cursor can be constrained to move vertically and there are HELP and graphics pages.

The two major omissions are the lack of separated graphics and the hold graphics control codes.

The final program is a disassembler, or should I say three disassemblers located at &2800, &5800, &7800. There's not much to say about these except perhaps that the ROM-based ones do it better.

I found this package a little disappointing although the Teletext designer with the changes mentioned could be the best on the market.

Alan Plume

Nice fun, but pricey

THE five programs in **Fun to Learn** (Shards Software) for 6 to 12-year-olds are Count, Mixer, Calculator, Starship and Codebreaker. The presentation is excellent, although most of the basic ideas are rather unimaginative.

The opening display has good colourful graphics and sound which would capture the attention of the user immediately.

Count displays a random number of characters on the screen, and you have to count how many you can see.

The computer tells you if you're right or not, whether your response is fast or slow and updates the score.

Mixer is an anagram program in which one has to guess a mixed up word. Clues can be sought, but each one reduces the number of points scored.

Words of up to nine letters are used, and one can also enter words of one's own for a friend to guess at.

Calculator gives practice in adding, subtraction, division or multiplication.

Starship is the best of all, a "Hangman" type game. A colourful starship and alien appear on the screen, with only a building between them.

You have to guess letters making up a mystery word, or the alien zaps a laser beam towards you.

The graphics are simple but effective, as are the sound effects.

The final program, Codebreaker, uses simple letter-for-letter codes to be solved. You can create your own codes, or type in words and sentences to be coded for you.

This is a nice collection but I find it rather overpriced.

Jane Jackson

STARTING AT THE DEAD END

LET'S face it, we BBC adventurers are becoming spoilt. There are so many top class games about now that a new adventure has to have quality and imagination to grab the attention.

And so, having loaded A&F's **Horror Castle,** and sat down in front of the TV set, I was a bit disappointed at first.

"Your objective is to release a beautiful princess . . ." What, another one? These days, you can't move inside the average castle without tripping over imprisoned princesses.

There seem to be an awful lot of them about – or could it be just one terribly unlucky girl? No matter. On with the game.

My second disappointment came almost immediately. Text-only adventures are greatly enhanced by imaginative descriptions of the locations.

The initial set-up in Horror Castle is this: "You are at a dead end". Hardly deathless prose.

By now I was expecting a pretty poor game, and was ready to reach the poison pen.

But an hour later I realised I was well in to the game and enjoying it.

Although it isn't a very long game, nor a particularly difficult one, there are enough puzzles to intrigue even the most seasoned campaigner.

The HELP and EXAMINE commands are useful, and there's a nice little twist at the end, just when you think you're cantering home.

Admittedly there are a few spelling mistakes that impart a vaguely amateurish feel, but overall, it's well put together, and good fun.

A&F SOFTWARE
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Not a great game, but a good one, and ideal for the inexperienced adventurer.

James Bibby

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SUPERB REVIEW!

FIRST AID!

DUALSCREEN MONITOR ROM

AID is now clearly established as the finest machine code monitor ROM for the BBC Micro. Designed for beginners and experts, AID is both powerful but still very easy to use. With a comprehensive set of over 40 commands AID will satisfy the demands of the most experienced programmer. Beginners also will soon feel at home with AID's friendly prompts and responses which make it such a good learning aid.

AID can tackle many tasks, from debugging machine code programs to revealing the secrets of machine code games using the unique and highly acclaimed DUALSCREEN graphics feature. Delving into the mysteries of the OS ROM you will find AID a source of lasting interest.

If you are taking your first tentative steps into the world of machine code or planning to write a chart topping machine code game then you can have no finer help than DUALSCREEN AID.

Acclaimed by the press and users alike . . .

❝My immediate impression of AID was that it was **a very professional product** . . . AID offers **additional features far in advance of other monitors** . . . I found it easy to use, particularly as the **user guide is very thorough and accurate** . . . I wish I had something like this when I first started dabbling in machine code . . . The last facet I explored was the **DUALSCREEN facility, which is perhaps the pearl of the system** . . . In conclusion, **AID seems a must for the serious machine code programmer** and a very useful learning aid for the novice. it is a highly professional product in every way and **could prove to be the standard by which others are compared.**❞ *"The Micro User" January 1984*

❝Having had your AID ROM 'under the bonnet' for two whole weeks I am at last able to escape its fascination in order to say **how delighted I am with it . . .** As a beginner at assembly language programming, I am finding your ROM not only **a very useful tool but also a real revelation,** like having a window into the 6502 and the whole working area of the micro . . . **It is very impressive** and I am grateful that such a powerful facility exists at all . . . I cannot see how such an **impressive feat of programming** as your incredible AID facility can be anything other than a runaway success . . . I would like to add my grateful thanks.❞ *C. Dent, Portsmouth*

CASSETTE – The original cassette version of AID (fewer commands) is still available. Easily transferred to disk. Price £10.00 + p&p for cassette plus 25 page manual.

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Sprite-Gen

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- **There can be up to EIGHT different SPRITE DESIGNS active at one time, each of which can have up to THREE "CLONES", (copies of the primary SPRITE but each with individual movement control).**
- **Each SPRITE actually has TWO images which given slight differences will achieve the animation effects when the two are alternated. Or, if you choose, give the two images totally different designs and you have created two SPRITES out of one, usable alternately. This technique can also be applied to the CLONES which means that all 32 SPRITES can be animated, multi-coloured, moving objects!!!**
- **Once you have completed the design of your SPRITES using the simple grid-based generator utility, they and the high speed machine-code routines that control their movement are secreted into RAM and the BASIC system is ready to accept your own program lines through which you can direct the SPRITES to appear, move, disappear or just remain stationary, with the simplest commands you could imagine.**
- **SPRITES can be linked together in pairs or groups to produce large scale animation. Of course, if you wish they can be as small as a single pixel.**
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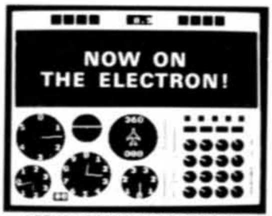

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We're certain that, when you've read it, you too will be struck with the clarity of Ian's easy-to-understand explanations, and want a copy for yourself.

So we've made obtaining this gentle guide to machine code programming as simple as possible by making it a *Micro User* special offer. See page 98 for full details.

The extract we've picked is on a subject we're often asked about – where exactly can you store machine code?

Knowing that the BBC Micro assembles its code to the memory location given by P% is one thing ... but how do you choose P% to ensure that the code is safe from, say Basic programs?

Read on, and Ian Murray will show you just how easy it is!

Good home wanted for machine code

(not too near Basic programs) APPLY WITHIN

By IAN MURRAY

THE assembly language on the BBC Micro is written as part of a Basic program. This is unique to the BBC machine as most other assemblers stand alone and have nothing whatever to do with Basic or any other language.

Obviously the machine code made by the assembler has to be found a safe home somewhere in the computer's memory. Preferably this home should not be part of or even near the Basic program itself.

If your Basic program with its assembly program "grows", then it may bump into where your machine code would like to rest. If your Basic program is unlikely ever to change in size, you may get away with putting the machine code near Basic. But best of all is to use the facilities provided for you by the BBC Micro.

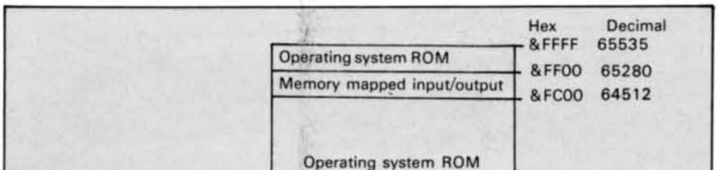
Hex
Decimal
&FFFF 65535
Operating system ROM
&FF00 65280
Memory mapped input/output
&FC00 64512
Operating system ROM
&C000 49152
4 paged ROM's eg Basic
&8000 32768
RAM used for high resolution graphics
HIMEM
Moveable boundary
Basic stack
32k RAM in Model B to &8000
&4000 16384
16k RAM in Model A to &4000
LOMEM
Dynamic variable storage
Moveable boundary
TOP
&2000 8192
User's Basic program area
PAGE
&E00 3584
Reserved for operating system use
&0000 0

Figure I: The BBC Micro's memory map

You now need to know something about how the memory is divided up. You would be foolish to try and put "your" machine code where the designers of the BBC Micro have put "their" code.

You will find a version of Figure I in the user guide on Page 500. As you can see, the whole of the top half of the memory is just not available to you. Memory locations from 65535 decimal to 49152 decimal are all used by the operating system.

This operating system is responsible for all the ordinary and clever tricks of the BBC Micro, such as getting the tape loading and saving to work, defining the red function keys, scanning the keyboard for which key you have pressed and putting it on to the screen, allowing you to change colours on the screen easily and quickly. The list is endless.

Then the Basic language takes up locations 49151 decimal to 32768 decimal. Remember, Basic needs all this memory so that it can work out the machine code equivalent of the program that you typed in in human readable form. For the more technical of you, Basic in the BBC Micro is an "interpreted language".

This means that, though you may

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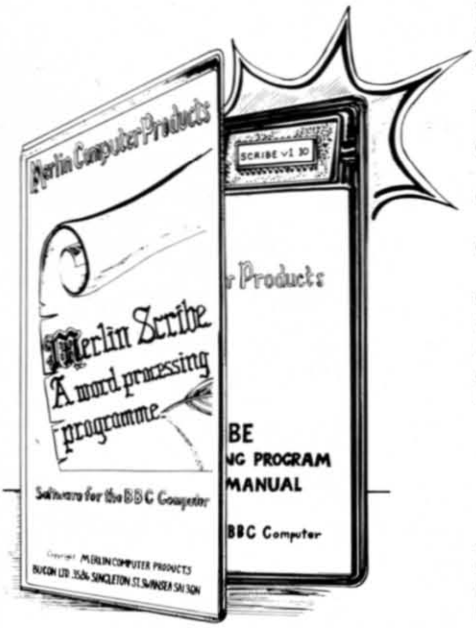
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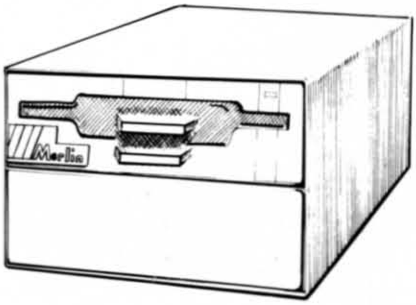

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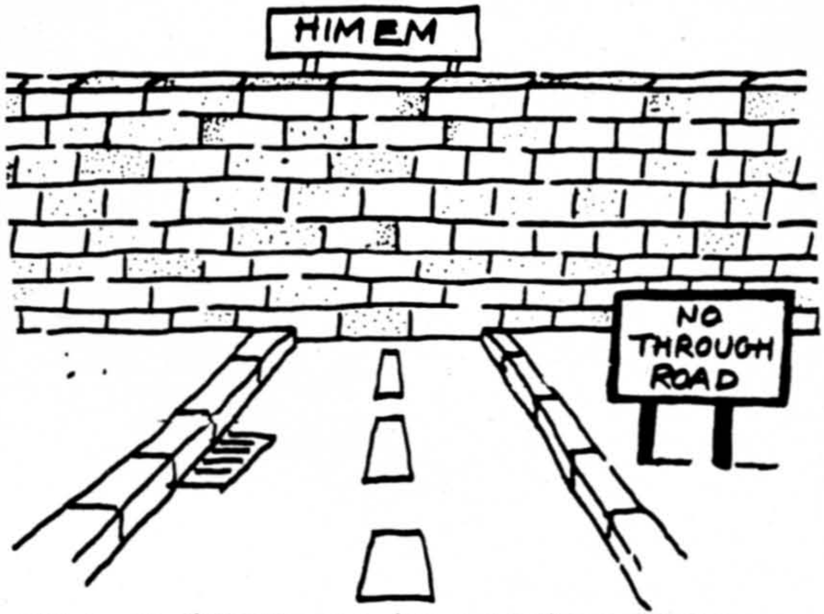

Think of HIMEM as a huge wall across memory.

From Page 99

have a 500 line Basic program, it goes to work converting into machine code only the actual instruction it has to carry out next, leaving all the others unconverted until needed.

We are told by the manufacturers that, starting from the bottom, memory locations 0 to 3583 decimal are also reserved for use by the operating system.

This means that the only memory location available to the Basic program you write, with the assembly program inside it, the machine code generated by the assembly program and the screen graphics, is from 3584 decimal to 32767 decimal (on a Model B machine).

Whatever you write in your Basic program is stored by the operating system upwards from 3584 decimal. If you type the Basic command:

```
PRINT TOP
```

then the top memory address used by your program will appear on the screen. TOP is a word reserved by Basic for this purpose.

Similarly if you type into the machine:

```
PRINT LOMEM
```

that will tell you where Basic intends to keep the values associated with any of the variables used in your Basic program. Mostly it will be one different from TOP – but you can change this.

The screen graphics need a slice of memory and this works down from location 32767 decimal. Where it finishes is shown by the Basic word HIMEM.

In every mode it is different. HIMEM is not the same in Mode 2 and Mode 7. Type into the machine:

```
MODE 2
PRINT HIMEM
MODE 7
PRINT HIMEM
```

You can think of HIMEM as a huge wall across memory. Most of the memory below HIMEM can be used by you in various ways.

None of the memory above HIMEM can be used by you as it is needed by either the screen, Basic language or the operating system.

But this is a wall with rollers under it. It is possible to roll the HIMEM wall down memory, creating empty space behind it and before the start of the screen graphics.

Typing in Mode 7 and PRINT HIMEM in a BBC Model B will have given you the answer 31744. If you type:

```
HIMEM = 31000
```

then you will have created 744 empty memory locations which are free for any machine code that you would like to pop into them. The first one free will be 31001 decimal. You can set the program counter to 31001 by typing:

```
LET P% = 31001
```

and then all the machine code you assemble will slip into the memory locations free to it.

But beware! If it turns out that you need more than 744 memory locations the computer will not tell you – unless you ask – and certainly no error messages will appear.

So after you have finished assembling your program into machine code you would need to type:

```
PRINT P%
```

to find out if it was 31744 decimal – or perhaps more – so intruding into the area for Mode 7 screen graphics.

For the technically minded, now is the time to reveal that strictly speaking P% is not the true program counter. It is a variable used by Basic and the BBC operating system which usually shows what the program counter has stored in it. But it operates just like the program counter.

So Rule 1 for finding space for machine code is:

MOVE HIMEM down memory.
PLACE machine code between HIMEM and start of screen graphics.

Problems with Rule 1:

- You have to make certain that you reserve enough space and do not overwrite screen graphics.
- Any change of mode in your program will reset HIMEM and probably lead to screen graphics in the new mode over-writing your machine code.
- As TOP shows where the Basic program itself is, we could place our machine code in some memory locations above TOP. We can type:

```
LET P% = TOP + 1000
```

Our machine code would then be placed from "TOP + 1000" upwards. This may interfere with work space that Basic needs, which starts at HIMEM and works downwards towards LOMEM. But as a temporary measure in Mode 7 it will work adequately.

Rule 2 for finding space for machine code is:

SET the program counter to a suitable value above TOP.

Problems with Rule 2:

- The location above TOP that you set for the program counter must give Basic enough room to store its variable values.
- With a large Basic program in Mode 7 or even a small Basic program in

→

Move LOMEM upwards to a suitable new location

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From Page 101

Mode 2 you must make sure that your resetting of the program counter does not take you too near HIMEM or you will not allow yourself enough memory space.

You can, of course, try to overcome one of these disadvantages by shifting the LOMEM wall upwards and fitting your machine code between TOP and LOMEM.

Basic's variables are dealt with where LOMEM starts, so you would have unused space by doing this shift, like:

LOMEM = LOMEM + 250

This would give you 250 free memory locations. You would then need to type:

LET P% = TOP

Rule 3 for finding machine code space:

MOVE LOMEM upwards to a suitable new location.
SET the program counter to TOP

Disadvantages of Rule 3:

- You must give yourself enough space for your machine code, or you will overwrite where Basic keeps its variable values.
- You must move LOMEM upwards before any reference to any variable. Otherwise that variable will sit where it usually does, just one above TOP. Your machine code would then overwrite it.
- You may move LOMEM too close to HIMEM causing the Basic to "scramble".

As you remember from Figure I showing how the BBC Micro's memory is organised, there are interesting areas at the bottom of memory.

Just as we can move LOMEM and HIMEM around in memory, so we can move PAGE.

PAGE always has the memory location of the beginning of your Basic program. For tape-based machines this is always 3584 decimal (&E00 hex). For disc-based machines this is different. For technical reasons any movement of the PAGE wall must be groups of 256 memory locations.

So we can type:

PAGE = PAGE + 512

This would give us 512 free memory locations from 3584 decimal upwards.

We could then type:

LET P% = 3584 *(for tape machines)*

This is a bit messy. It would be better to type:

LET P% = PAGE - 512

This would mean it would not matter if you were using disc or tape machines.

Rule 4 for finding space for machine code is:

SET PAGE to a new value above its current value. This must be a multiple of 256.
SET the program counter to the old value of PAGE.

Disadvantages of Rule 4:

- Any new Basic program you now load must be forced to load above the machine code, either by manually resetting PAGE to the suitable value, or by specifying the load address when you do load it.
- If you need 260 memory locations for the machine code, then you will have to take the full 512 memory locations, which will mean wasting empty memory locations. This could be significant in a high resolution graphics program.

The BBC Micro's operating system seems (with tape-based machines) to have left memory locations 3328 decimal (&D00 hex) to 3583 decimal (&DFF hex) free for machine code use.

If this is enough space for you, then you can type:

LET P% = 3328

or

LET P% = &D00

These mean the same. &D00 is 3328 in the hexadecimal counting system which will be explained in detail later. Some of the games programs on the market hide their machine code at &D00. You may have noticed this.

Rule 5 for finding machine code space:

SET the program counter to 3328 decimal (&D00 hex).

Disadvantages of Rule 5:

- Very little space is available to you for the machine code before you start overwriting the Basic program beginning at 3584 decimal.
- If you have a disc based system, you will find that the system itself uses some of this memory. Then you may find that the machine code starts doing funny things to the disc drives (such as turning them on), or that any disc load operations are incorrect or that use of the Break key overwrites your machine code.

This is often the cause of problems you may have found with copying machine code games over to a disc system. These games probably had machine code sitting at &D00 hex.

Rule 5 can sometimes be extended to start at either 3072 decimal (&C00 hex) or 2816 decimal (&B00 hex). These memory locations also get round the problems with disc based machines.

But you can only use them if:

☐ Nowhere in your program do you use program (or user) defined characters. These are stored from 3072 decimal (&C00 hex) to 3327 decimal (&CFF hex).

☐ Nowhere in your program do you use the red function keys. Your plans for these keys are stored in memory locations 2816 decimal (&B00 hex) to 3071 decimal (&BFF hex).

But, as I said earlier, the BBC Micro does try to make life easy for you. The designers were aware that all these different hiding places for machine code could be annoying to organise. They invented a special Basic command which allows the BBC operating system to fit in your machine code wherever it can find space, thus taking the worry off your shoulders.

If you type:

LET P% = DIM A% 300

then the program counter is set to start at a 300-long block of memory locations which begins at A%. You do not need to know where the block of memory is, but you can find out by typing:

PRINT A%

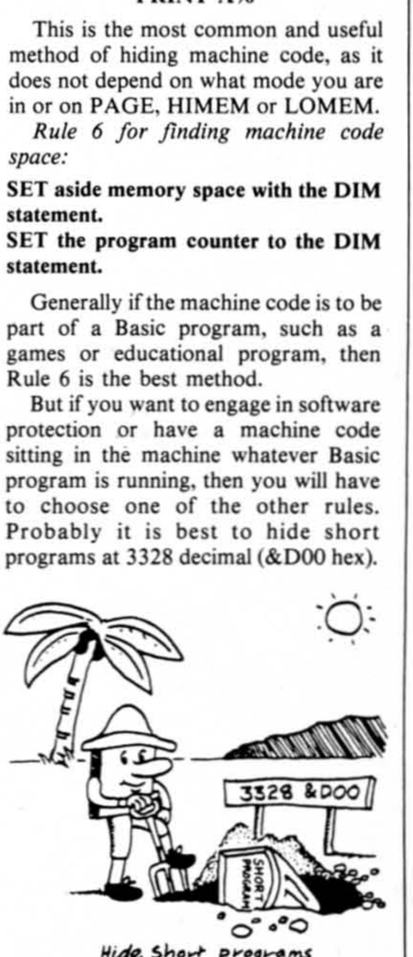
This is the most common and useful method of hiding machine code, as it does not depend on what mode you are in or on PAGE, HIMEM or LOMEM.

Rule 6 for finding machine code space:

SET aside memory space with the DIM statement.
SET the program counter to the DIM statement.

Generally if the machine code is to be part of a Basic program, such as a games or educational program, then Rule 6 is the best method.

But if you want to engage in software protection or have a machine code sitting in the machine whatever Basic program is running, then you will have to choose one of the other rules. Probably it is best to hide short programs at 3328 decimal (&D00 hex).



Hide short programs at 3328 (& D00 hex)

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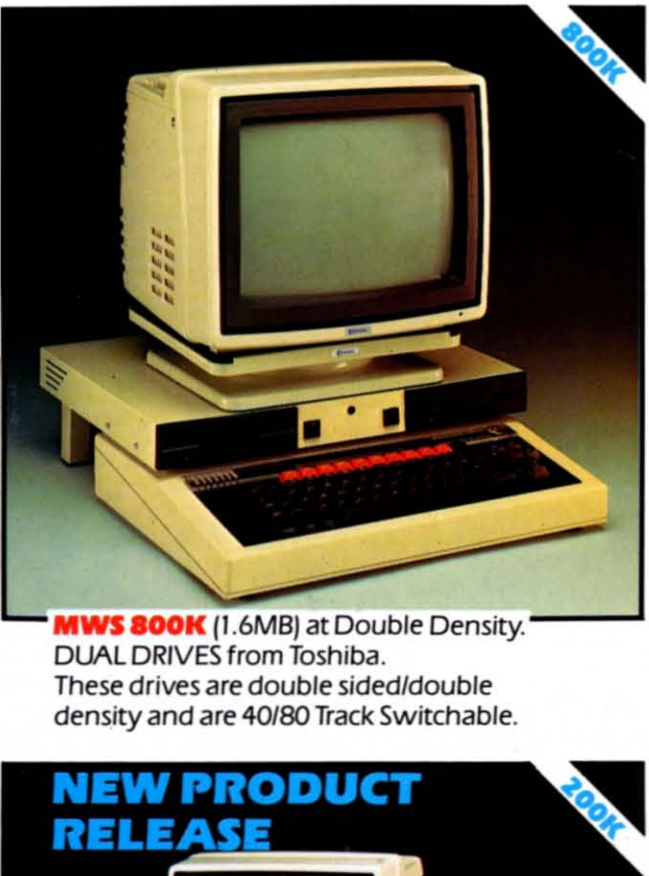

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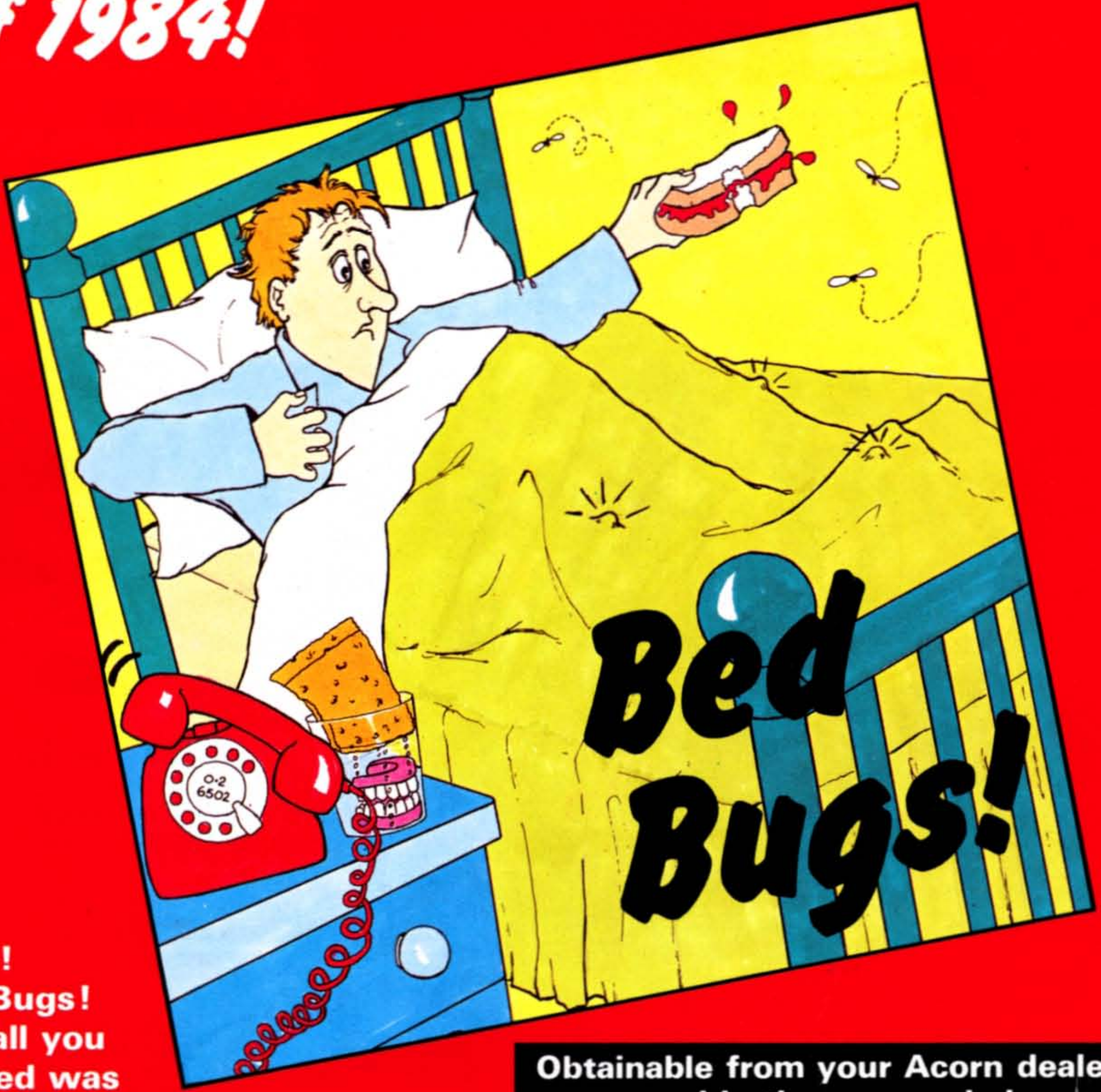

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NIGEL PETERS concludes his sound advice

One final effort and we've got the ENVELOPE

THE Editor staggered past my desk. "This is the last article in my Sound series, Sir", I cringed.

"Thank goodness for that", he slurred, "I only meant you to do a half page filler in the first place. I don't know why you got so carried away with it all".

He weaved his way to his office accompanied by the sound of my head banging against the desk.

IN the last article we explored the ENVELOPE command and saw how we could use it to vary the pitch of a note. We studiously ignored the last six of the 14 parameters that follow ENVELOPE.

This month we'll be dealing with these last six and seeing how the values we give them can affect the amplitude, or loudness, of a note.

The full set of ENVELOPE parameters is:

```
ENVELOPE N,T,PI1,PI2,PI3,PN1,PN2,PN3,
AA,AD,AS,AR,ALA,ALD
```

Let's go straight on to Program I and see what happens if we put values in two of these amplitude parameters.

```
   10 REM PROGRAM I
   20 ENVELOPE 1,100,0,0,0,0,0,0,
      30,0,0,0,120,0
   30 SOUND 1,1,50,80
   40 SOUND 1,0,0,0
```

The note played by the SOUND command in line 30 gets louder (in four steps) and then stops. This is a result of the parameters we put in the last part of the envelope definition.

Table I gives a list of these parameters and their effects and ranges. I have stuck to the standard parameter name abbreviations for the sake of uniformity.

You might ask why have these amplitude parameters anyway – surely they just make things more complicated?

The answer is that they do, but they also allow the BBC Micro's sound generator to mimic musical instruments.

When a note is played on a violin or piano it doesn't have the same loudness all the time. It builds up from silence to a maximum and then gets quieter again.

Each instrument has a different amplitude envelope, as this characteristic increase and decrease in loudness is called.

Some achieve their maximum loudness rapidly, then fade away quickly. Others take relatively longer to reach their full power and then die away gently.

Until now all we have used to control the loudness of a sound was the amplitude parameter of the SOUND command. As you'll remember, this is the second one after the SOUND.

The note started at the loudness specified by that parameter and stayed there until it finished. It was simple, but it wasn't like real life.

Parameter	Range	Meaning
AA	−127 to 127	Amplitude change per step in the attack phase.
AD	−127 to 127	Amplitude change per step in the decay phase.
AS	0 to −127	Amplitude decrease during each step of sustain phase.
AR	0 to −127	Amplitude decrease during each step of release phase.
ALA	0 to 126	Target (maximum) value achieved during attack phase.
ALD	0 to 126	Target (minimum) value achieved during decay phase.

Table I: Amplitude parameters of ENVELOPE

The amplitude part of the ENVELOPE command was designed to overcome this. It divides the time the note plays into four sections, each with a different characteristic. Figure I shows this schematically.

The first section is the attack phase. In this the note builds up from nothing to its maximum loudness. The parameters **ALA** and **AA** control this phase.

After the note has reached its peak, it enters the decay phase, where it goes into a gradual decline. The parameters **ALD** and **AD** govern this.

The final two sections are the sustain phase and the release phase, controlled by **AS** and **AR** respectively.

We'll ignore these last two for the time being and go back to Program I to see what caused the changes in loudness we heard.

Notice that it is only the loudness which is changing. The pitch of the note stays exactly the same.

```
   10 REM PROGRAM I
   20 ENVELOPE 1,100,0,0,0,0,0,0,
      30,0,0,0,120,0
   30 SOUND 1,1,50,80
   40 SOUND 1,0,0,0
```

If you look at the envelope defined by line 20, you'll see it has the label **1** and each step lasts for one second. The six pitch parameters are all 0, so they don't have any effect on the note.

licked

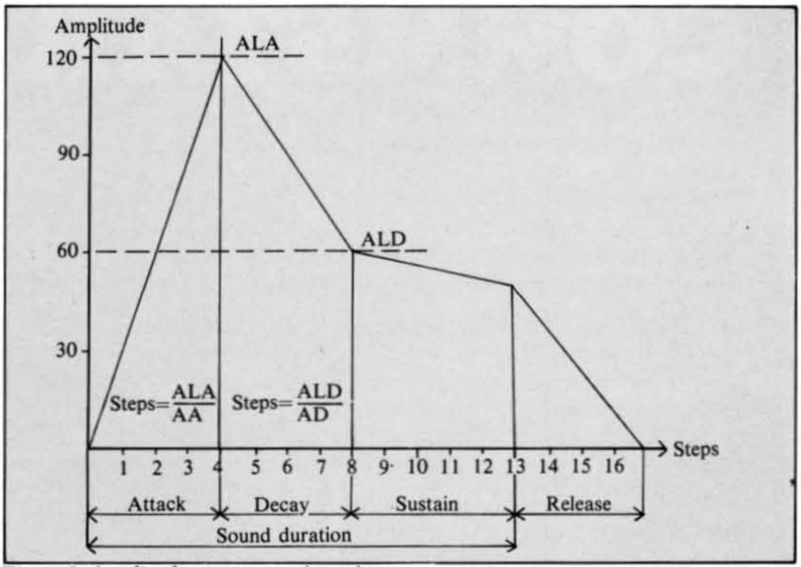

Figure I: Amplitude parameters in action

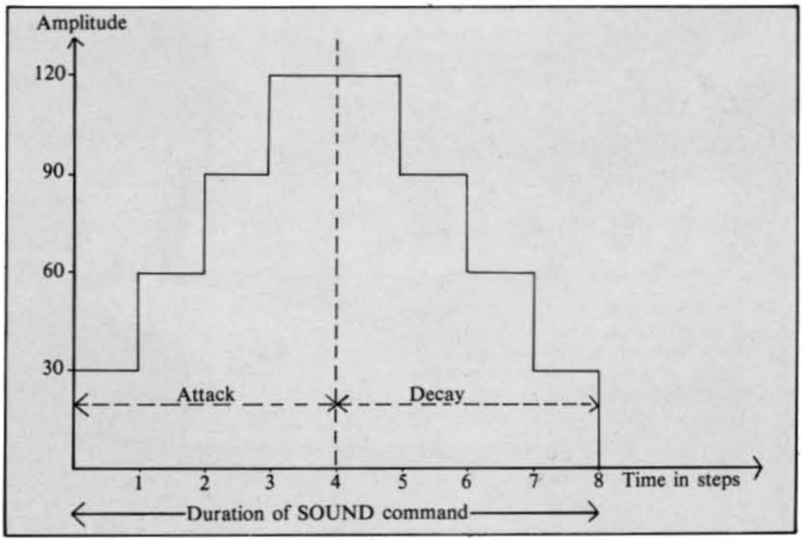

Figure II: Program II's amplitude envelope

The only parameters that have a value assigned to them are **ALA** and **AA**, the ones that govern the attack phase.

The maximum loudness the note can reach is fixed by **ALA**. This can have values between 0 and 126, corresponding to the range of 0 to −15 allowed by the SOUND command.

As you can see, the amplitude envelope allows for much finer volume control.

In Program I the level is set at 120, mainly because it's loud and divides easily. The rate at which the loudness of the note increases to get to this maximum level is fixed by the parameter **AA.**

This can have values from −127 to 127, is normally positive and is the change of amplitude per step. It corresponds to the gradient of the attack phase shown in Figure I. For each time step forward the volume of the note increases by **AA.**

In program I the value is 30. For each time step forward the volume of the note will increase by 30 until it reaches the level of 120.

The number of steps it takes to do this is 120 divided by 30, which give the answer four. We can actually hear the four steps as the program runs.

Since each step lasts for one second the whole thing takes four seconds, which is the value I've made the note sound for in line 30.

Don't worry about the SOUND command in line 40. It's just a dummy note, there to catch garbage. You'll learn its significance later.

Run Program II and you'll hear it has eight steps. The sound gets louder, then fades away because there are now values for the decay phase of the amplitude envelope.

The target value **ALD** is now 0 (no volume) and the drop in amplitude per time step, **AD,** is now −30.

Figure II shows what has happened.

```
10 REM PROGRAM II
20 ENVELOPE 1,100,0,0,0,0,0,0,
   30,-30,0,0,120,0
30 SOUND 1,1,50,160
40 SOUND 1,0,0,0
```

Notice that the peak amplitude lasts for two steps.

This "doubling" effect occurs where two phases join and can lead to some unexpected results if you don't keep it in mind.

Still that's for later when you experiment with envelopes for yourself. Remember though, if you think that something has lasted a step more than it ought it's probably because of the "join" of two phases.

You'll notice that I have increased the duration of the SOUND command in line 30 to eight seconds, exactly the

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From Page 109

length of the envelope.

You might wonder what would happen if the duration of the SOUND command was shorter or longer than that dictated by the parameters of the ENVELOPE command governing the sound. Program III shows what happens if it's shorter:

```
10 REM PROGRAM III
20 ENVELOPE 1,100,0,0,0,0,0,0,
   30,-30,0,0,120,0
30 SOUND 1,1,50,80
40 SOUND 1,0,0,0
```

Here the duration of the sound is only four seconds, while looking at the parameters of the envelope would lead us to expect it to last eight seconds as before.

What happens is that the sound lasts for four seconds, so only the first four seconds of the envelope get a chance to work. The rest, in this case the decay phase, is ignored.

Program IV shows us what happens if the duration of the sound exceeds that of the parameter:

```
10 REM PROGRAM IV
20 ENVELOPE 1,100,0,0,0,0,0,0,
   30,-30,0,0,120,0
30 SOUND 1,1,50,200
40 SOUND 1,0,0,0
```

As you might expect, the note carries on at the final volume it reached, finishing off the duration parameter of the SOUND command.

The trouble is that since the final loudness of the sound is 0 we can't hear it! Still, it is there, playing away silently until the ten seconds are up.

If you don't believe me, make the SOUND command in line 40 produce a real sound on the same channel. You won't hear it until the ten seconds are up.

Now the value of **ALD** doesn't always have to be 0. We can have any value between 0 and 126.

In Program V **ALA** has the value of 60. This is the target volume for the decay phase and it is reached in steps of −30 **(AD).**

```
10 REM PROGRAM V
20 ENVELOPE 1,100,0,0,0,0,0,0,
   30,-30,0,0,120,60
30 SOUND 1,1,50,120
40 SOUND 1,0,0,0
```

With Program V the duration of the SOUND is such that it finishes at the same time as the amplitude reaches 60, after six seconds.

The trouble is that this means you can't hear the note at its final volume as you cut off the sound just as it reaches it.

Program VI is exactly the same, except that it lasts for nine seconds. Now you can hear the final decrease in volume.

Notice again that the sound continues at the final loudness reached until all of the duration parameter of the SOUND command is used up.

```
10 REM PROGRAM VI
20 ENVELOPE 1,100,0,0,0,0,0,0,
   30,-30,0,0,120,60
30 SOUND 1,1,50,180
40 SOUND 1,0,0,0
```

But what of the sustain phase, governed by the parameter **AS**? *What does this do?*

It's quite simple really. All that it does is use up the rest of the duration of the SOUND command. The attack and decay phase both use up part and the sustain phase lasts for whatever period, if any, is left.

Now that we know how long the sustain phase lasts, let's see what it does by running Program VII, which gives **AS** the value of −15:

```
10 REM PROGRAM VII
20 ENVELOPE 1,100,0,0,0,0,0,0,
   30,-30,-15,0,120,60
30 SOUND 1,1,50,200
40 SOUND 1,0,0,0
```

As you can hear, the volume increases to 120 and decreases down to 60 as you might expect from the parameters. This uses up six seconds of the 10 that the note will play for.

During the remaining four seconds of the note the amplitude envelope enters the sustain phase. Here the **AS** parameter is −15. This, as you might guess, means that the volume decreases by a factor of 15 for each time step.

In this program the volume in the sustain phase goes down from 60 by 15 each second. It gets to 0 volume just as the time runs out.

```
10 REM PROGRAM VIII
20 ENVELOPE 1,100,0,0,0,0,0,0,
   30,-30,-15,0,120,60
30 SOUND 1,1,50,240
40 SOUND 1,0,0,0
```

Program VIII is the same as Program VII except that the duration of the note caused by the SOUND statement is now 12 seconds. The volume still reaches 0 after ten seconds but the note keeps playing, silently, for the last two seconds.

Again, if you don't believe me put a real note on channel 1 in line 40 and it won't sound until the note in line 30 has had its full 12 seconds.

Of course you don't have to arrange it so that **AS** eventually reduces to 0 volume. In Program IX it has the value −5 so the volume doesn't have a chance to reach 0 before the time runs out.

```
10 REM PROGRAM IX
20 ENVELOPE 1,100,0,0,0,0,0,0,
   30,-30,-5,0,120,60
30 SOUND 1,1,50,240
40 SOUND 1,0,0,0
```

Looking at Program X two things are apparent. Line 40, the garbage collecting line, has gone and the value of **AS** is now −10.

A quick calculation will show that the attack and decay phases will take six seconds. A decline of −10 for each of the six remaining one second steps of the sustain phase should take the volume to 0 just as the note finishes playing.

Try it and see!

```
10 REM PROGRAM X
20 ENVELOPE 1,100,0,0,0,0,0,0,
   30,-30,-10,0,120,60
30 SOUND 1,1,50,240
```

The note carries on beyond the 12 seconds you'd expect from the SOUND command.

What's happened is that the sound generator has come to the end of the sustain phase and entered the release phase.

This is a rather weird construction which is independent of the duration parameter of the SOUND command.

The envelope reaches the end of the sustain phase when the duration of the note runs out. The sound generator then searches around for something to do next.

If a note is waiting on the same channel it will play it. If not it will carry on playing the last note until the next note comes along.

Never mind that the duration set by the SOUND command has been used up. The release phase carries on

→

From Page 111

regardless.

During this release phase, the volume of the note can be made to fade away by giving **AR** a negative value. It will carry on decreasing by this amount per time period until it eventually reaches 0 or another note is placed on that channel.

The eventual target volume is 0, the decrease per step is **AR** and the whole phase is independent of the duration parameter of the note.

As you can see from Program XI, if **AS** and **AD** are both 0 and there is not other note on that channel queue, the note carries on and on. This is because there's no decline to 0 volume in the release phase.

Hence the dummy note I've put in line 40 of the previous program – without it the note is endless and would confuse all the examples.

```
10 REM PROGRAM XI
20 ENVELOPE 1,100,0,0,0,0,0,0,
   30,-30,0,0,120,60
30 SOUND 1,1,50,240
```

As I said, it's a strange part of the amplitude envelope. It's mainly meant to mimic the dying away of a note on a musical instrument.

You'll notice that if there's a note following it on the same channel the envelope never enters the release phase. It just gets on with the next note.

There are times when we might want to give a note a release phase, despite other notes behind it in the same queue.

We can force the note to enter its release phase, despite any following notes, by putting a dummy note after it such as:

```
SOUND &1001,0,0,0
```

This makes the **T** parameter of the SOUND command equal to one, which forces the previous note to enter the release phase.

See my article in the January 1984 *Micro User* if you don't know where the **T** parameter goes or why we've got a & in the SOUND command.

I find the sustain and release phases a nuisance most of the time, so I just use the values of −127 for each. This effectively switches them off because as soon as the note enters either phase the volume is decreased to 0, whatever it was before.

Program XII shows this in action:

```
10 REM PROGRAM XII
20 ENVELOPE 1,100,0,0,0,0,0,0,
   30,-30,-127,-127,120,60
30 SOUND 1,1,50,240
```

And that's the end of the article and the series. I've covered the SOUND and ENVELOPE commands and their parameters. The rest is up to you.

Now that you understand them, why not use the ENVELOPE defining programs we've run in the pages of *The Micro User* to make up your own ENVELOPES? If you come up with any good ones, send them in and let us have a look at them.

In the meantime I'm working on my own sound. It'll be the noise made by the Editor when he's hit with a disc drive.

Of course I've no idea what that sounds like as yet, but I'm going to find out.

This may be the last article from me for a while!

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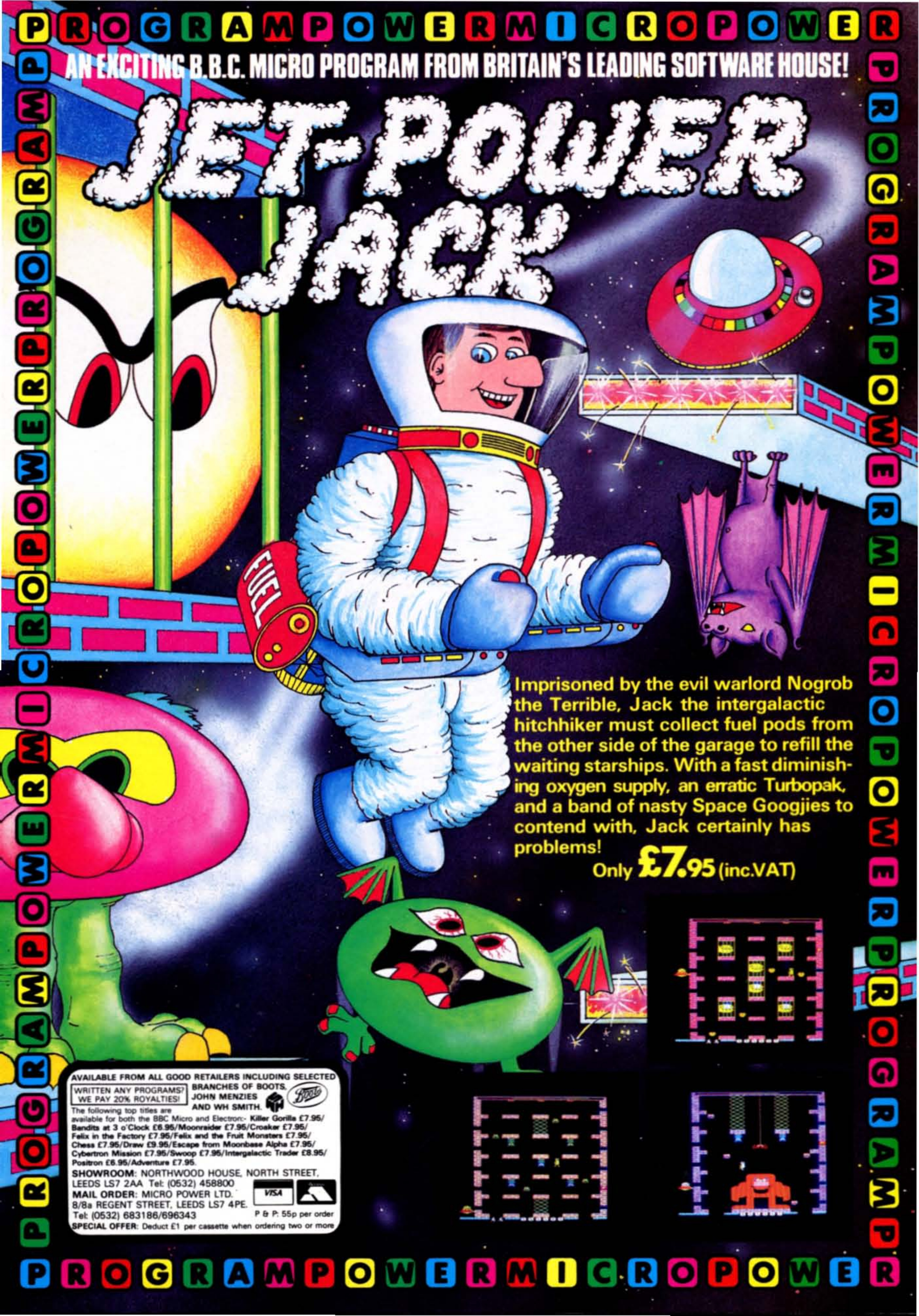

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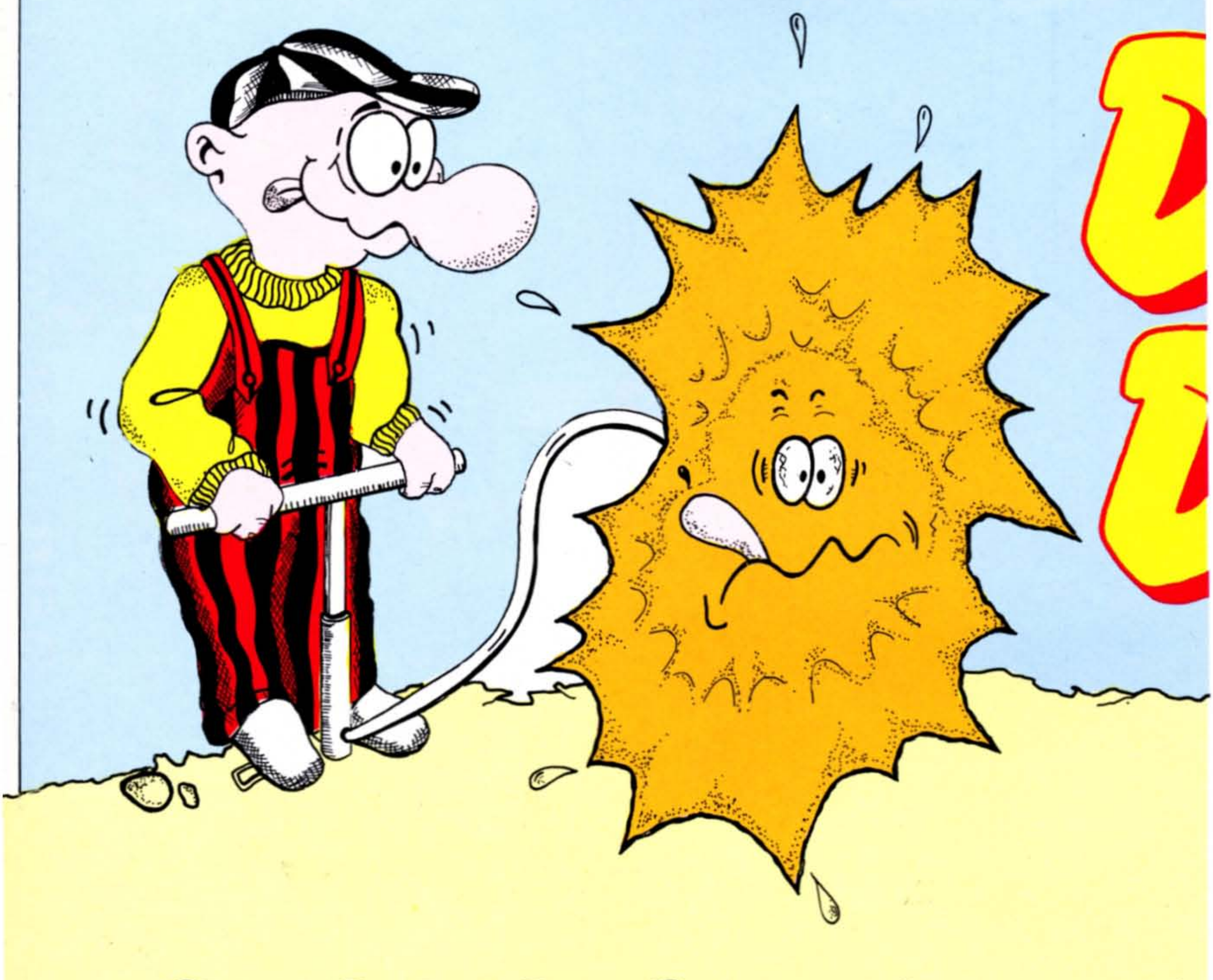

AFTER taxing your brain and fingers with Mazemunch *(Micro User*, March), Simon Phipps has come up with another megaspectacular – Dug-Dig.

The game follows the adventures of Bill the spaceman. He acquires a rather cheap starship, together with a copy of "Jewels of the Universe" by Gugvunt Bleuch and a Vactonics pump gun from a rather shady character on Cyrus IV.

He then sets off in search of the fabled Grungite Krystals of Botch.

After jetting across the galaxy, Bill lands on a small asteroid in the Hilton system and immediately sets to work scanning for the precious gems.

Maybe it is the prospect of fame, general recognition and a healthy credit account that keeps him going. But after searching the asteroid thoroughly he follows the instructions in chapter 21867 of Mr Bleuch's book – and begins to dig.

This game celebrates Bill's exploits. The idea is to dig down into the depths of the asteroid and pick up one of the flashing crystals at the bottom of the screen.

Only one can be carried at a time, so the crystal must be taken back to the starship at the top of the screen before any more can be collected.

The Scrungolds cause more trouble by chasing Bill around the screen but at a slightly slower rate than he can move, because alien nasties don't usually carry spades.

To help deter the monsters Bill can use the pump gun which fires in the direction in which he last moved. The gun can only be fired into an empty space – an underground hole or somewhere Bill or one of the Scrungolds has been.

The game is very tight on memory, so be careful not to add extra spaces.

It will need to be downloaded to &E00 on disc based machines.

now follow Bill the
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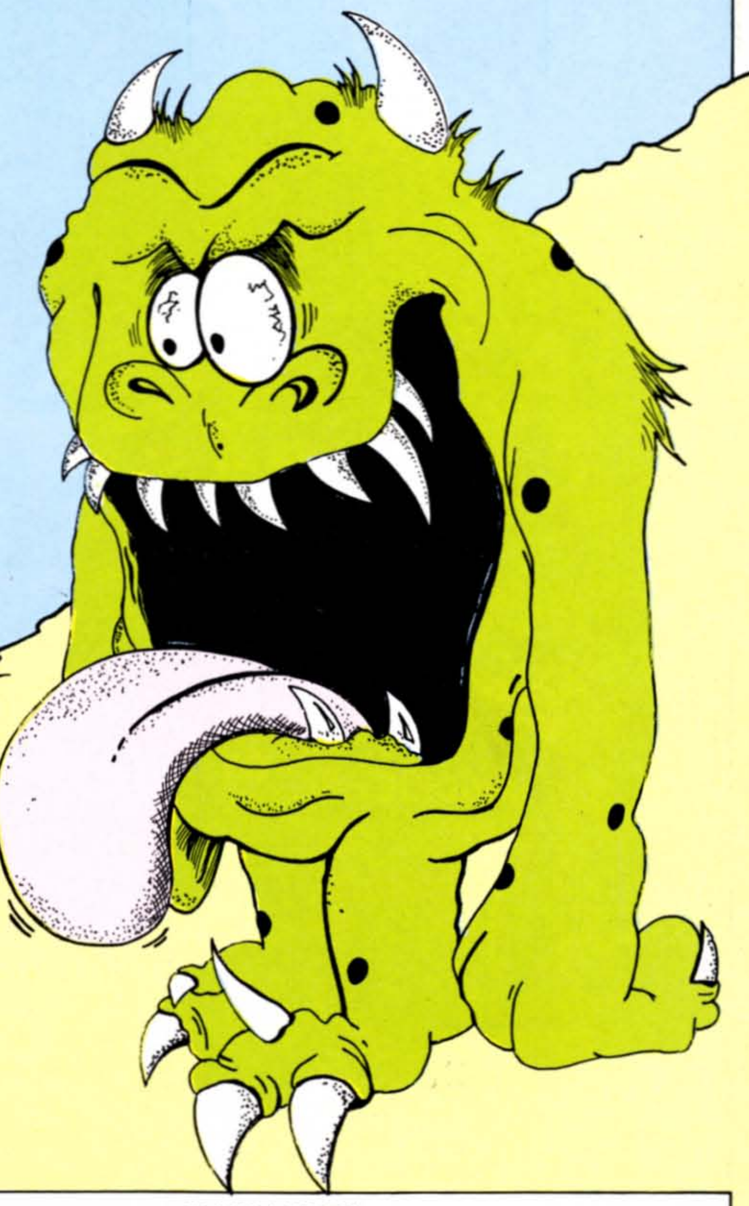

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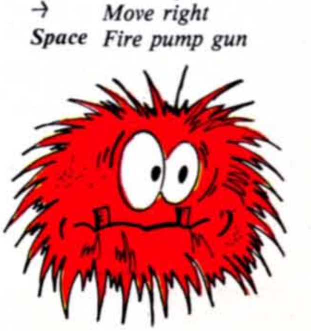
CONTROLS

4	*Move up*
Z	*Move down*
←	*Move left*
→	*Move right*
Space	*Fire pump gun*



VARIABLES

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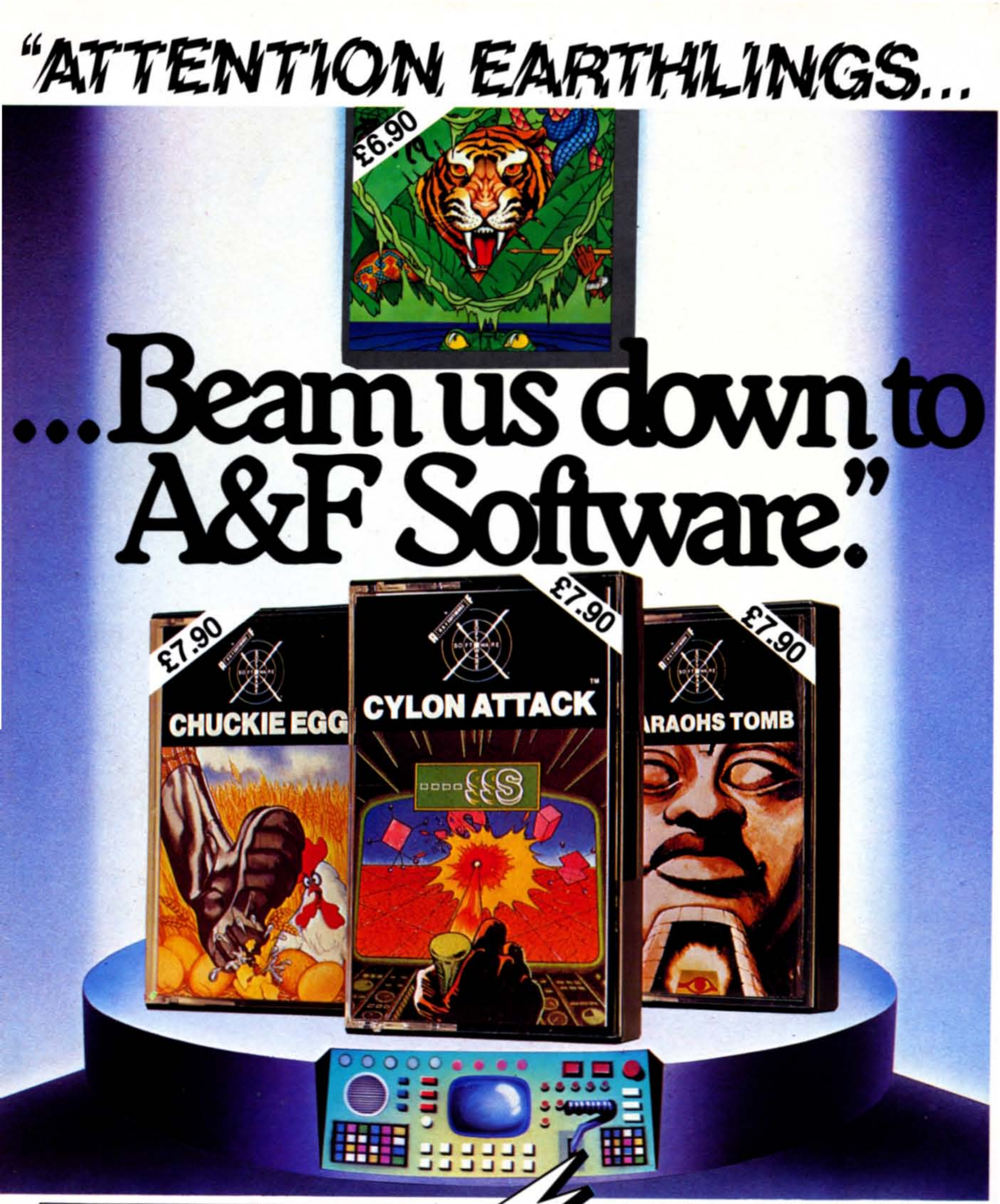
B%	General random variable used in PROCSCREEN, title page animation routine and PROCPUMP.
C%	Value of highest score attained. Displayed next to HI= on bottom of screen.
CRY%	Determines whether man is carrying a crystal. CRY%=1 means man is carrying crystal.
D%	FOR-NEXT loop. Performs various functions – generating sound, checking next character in new monster position, etc.
E%	Moves monster in the title page's animation routine. X co-ordinate set to −1 permanently.

→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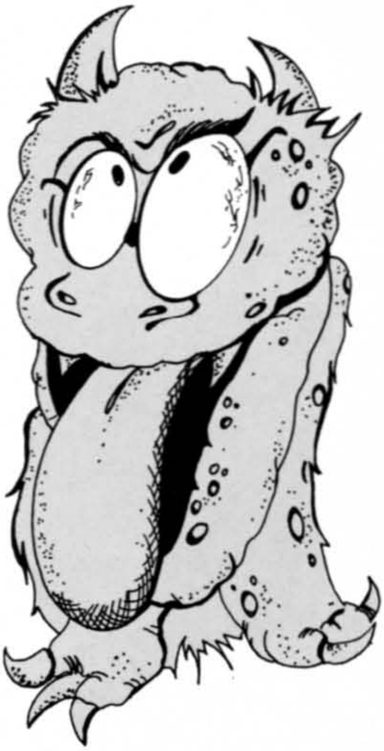
From Page 115



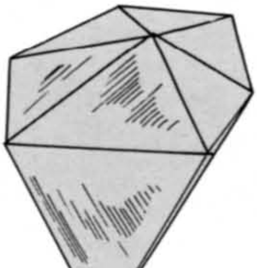
G%	FOR-NEXT loop. Draws on the effect of firing a pump gun (multi-coloured squares).
H%	FOR-NEXT loop. Controls which monster (in PROCMONS) is being presently updated.
I%	FOR-NEXT loop. Prints on blank areas on screen in PROCSCREEN.
J%	Used in conjunction with V% to check if use of pump gun was effective.
K%	General FOR-NEXT loop.
KIL%	Checks to see if man is dead (if KIL%=1).
KRISTAL%	Number of crystals retrieved by man from bottom of screen. When KRISTAL%=10 a new screen is generated.
LIVES%	Number of lives left (player's man).
MX%	Used by PROCMONS controlling monster's X co-ordinate after final analysis is stored in X%( ).
MY%	Used by PROCMONS controlling monster's Y co-ordinate after final analysisis stored in X%( ).
OP%	Last non-zero value of P% which is used to determine in which direction pump gun is fired – that is, last direction man moved in X direction.
OQ%	Last non-zero value of Q% which is used to determine in which direction pump gun is fired – that is, last direction in which man moved in Y direction.
P%	Used by PROCMOVE to control the value added to man's X co-ordinate if OP% is non-zero after updating position.
P1%	Used by PROCMONS to control value added to monster's X co-ordinate.
Q%	Used by PROCMOVE controlling value added to man's Y co-ordinate if OQ% is non-zero after incrementing position.
Q1%	Used by PROCMONS to control value added to monster's Y co-ordinate.
SC%	Total number of points scored by man during game.
SP%	Discerns whether attract mode has been activated – that is, if SP%=0 attract mode else if SP%=1 player controls man's movement.
T%	General FOR-NEXT loop.
V%	Used to check if firing of pump gun was effective.
X%	X co-ordinate of player's man.
Y%	Y co-ordinate of player's man.
Z%	FOR-NEXT loop. Controlling height of starship to start of screen animated landing routine.
c%	Colour of string to be printed at x,y in PROCP(x,y,c,a$).Often set to 0 since most strings contain colour control codes.
x%	X co-ordinate of VDU5:PRINTTAB(x,y)a$ simulated by PROCP(x,y,c,a$).
y%	Y co-ordinate of VDU5:PRINTTAB(x,y)a$ simulated by PROCP(x,y,c,a$).
B$	Definition of magenta/red earth stuff that is dug through by man.
CRY$	Display definition of crystals located at bottom of screen.
MAN$	Display definition of small man character.
ROK%	Display definition of blue rocks located at screen bottom and below starship. These rocks cannot be dug away.
SHIP$	String holding display definition of starship located at top of screen.
SPLOT$	String holding display definition of SPLAT produced when monster is effectively 'pumped'.
a$	Used by PROCP as string to be printed at x,y in colour C when called by main program.
A	Used as a small 0.3 second delay in PROCSCREEN during initial animation routine leading to screen set up.
KK	General variable used in delay loops and in PROCSOUND for pitch of note.
T	Delay loop variable from 0 to 3000 in PROCSOUND.
ZZ	General variable containing duration of note.

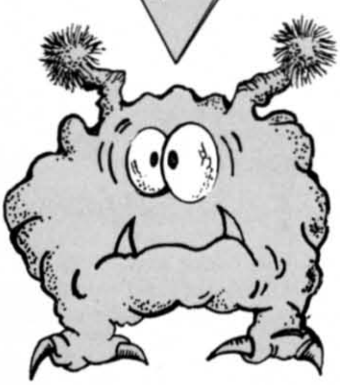
→

From Page 117

ARRAYS

M%	Contains information about each character at each PRINTTAB(x,y) position around the screen on a 19 × 31 matrix.
X%	Contains X co-ordinates of all three monsters.
Y%	Contains Y co-ordinates of all three monsters.
MON$	Display strings for all three monsters – utilised by PROCP(x,y,c,a$).





PROCEDURES

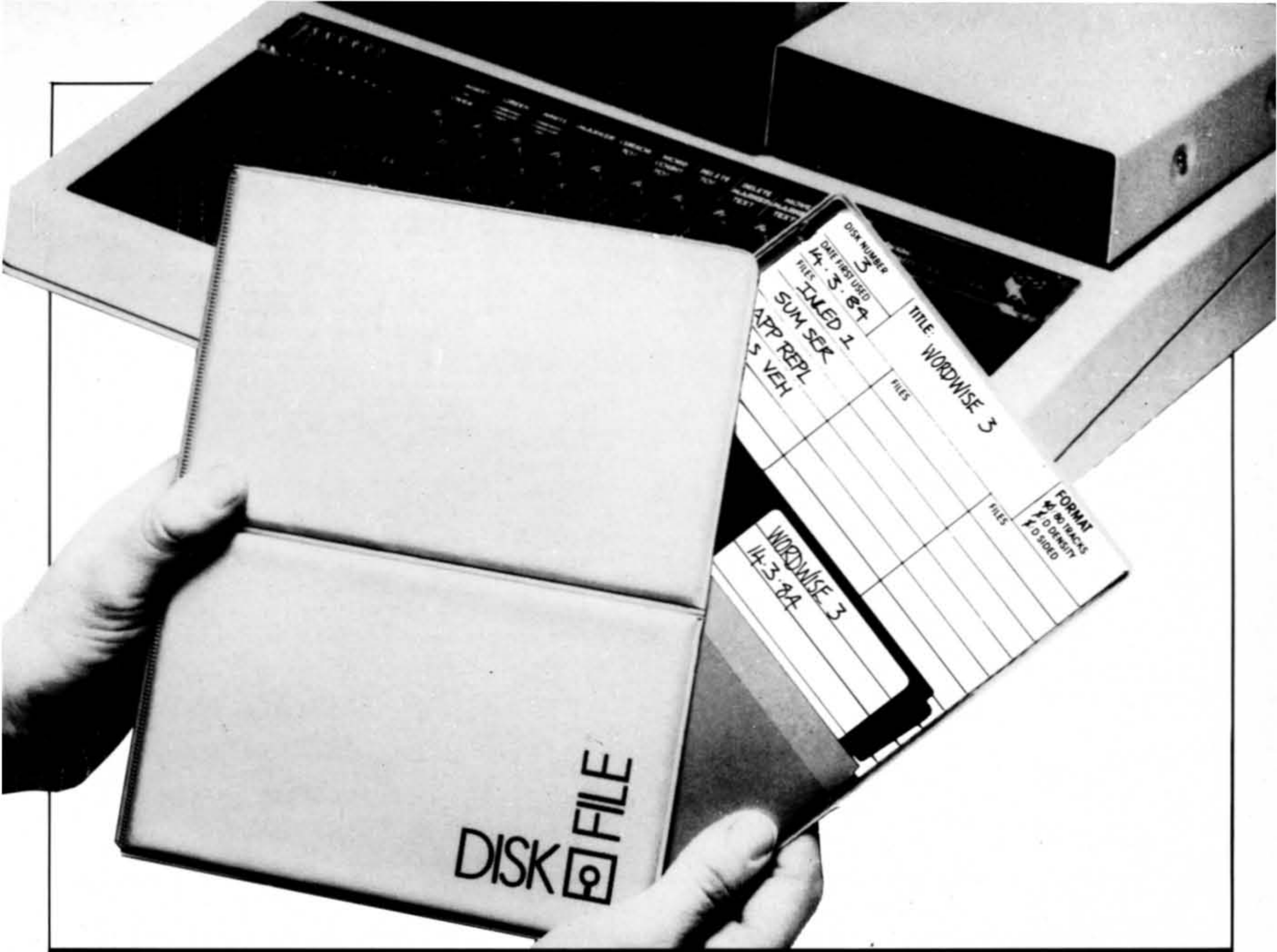
PROCDED	Kills man by printing CHR$242 at X%,Y% and resets the crystals at the bottom of the screen if man is carrying one.
PROCEND	Prints GAME OVER in centre of screen and checks if present score is higher than the present high score.
PROCINIT	Initialises MAN$ and MON$( ) since both are printed on the screen by use of VDU5 – using PROCP(x,y,c,a$) where x = X co-ordinate, y = Y co-ordinate, c = colour, a$ = character to be printed.
PROCMEN	Displays number of lives in top right hand corner of screen. Also ensures that man cannot walk over life display by setting M%(0,0), M%(1,0), M%(2,0) to 240.
PROCMONS	Updates positions of attacking monsters by working out values for P1% and Q1%.
PROCMOVE	Updates position of man, checks for use of pump gun depending upon key press or if SP%=0 on a random value (attract mode).
PROCP	Performs the VDU5:PRINTTAB(x,y)a$ available on OS 0.1 BBC Micros. This was originally written on a OS 0.1 machine.
PROCPUMP	Fires pump gun in direction dictated by OQ% and OP% checking if off screen, etc. Gun cannot be fired into anything but clear space.
PROCSCORE	Displays present score and high score at bottom of screen.
PROCSCREEN	Draws at screen, initialises crystal positions in M%(x,y) and displays man and monsters.
PROCSOUND	Plays a small tune.

Dug Dig listing

This listing was produced using a special formatter which breaks one program line over several lines of listing. When entering a line don't press Return until you come to the next line number. Full details of the formatter are in the July 1983 issue of The Micro User.

```
10 ENVELOPE 1,1,12,-5,15,1,1,60
    ,127,0,127,127,-127,-127
    :ENVELOPE 3,1,-10,-37,-89,24
    ,13,46,43,106,64,64,135,0
    :ENVELOPE 2,4,0,0,0,0,0,0,250
    ,-10,-10,-1,126,60
20 VDU 23,224,56,56,16,254,16
    ,40,40,108,23,225,0,0,0,56
    ,16,40,40,0,23,255,255,255
    ,255,255,255,255,255,255,23
    ,254,85,170,85,170,85,170,85
    ,170,23,226,24,24,60,126,255
    ,255,255,153,23,227,24,0,0
    ,24,24,0,0,0
30 VDU 23,228,0,0,0,0,129,129
    ,153,153,23,229,8,42,28,119
    ,28,42,8,0,23,230,65,20,34
    ,8,34,20,65,0,23,240,0,126
    ,126,126,126,126,126,0,23,231
    ,68,56,16,16,254,130,68,56
40 VDU 23,232,0,0,108,68,0,0,0
    ,0,23,233,0,0,0,24,24,0,0,0
    ,23,234,0,0,24,36,36,24,0,0
    ,23,235,0,60,66,66,66,66,60
    ,0,23,236,126,129,129,129,129
    ,129,129,126
50 VDU 23,237,195,66,126,153,153
    ,126,60,102,23,238,0,0,0,102
    ,66,0,0,0,23,239,126,153,153
    ,255,129,129,129,126,23,241
    ,0,102,66,0,36,0,36,0,23,242
    ,128,72,1,34,132,52,110,255
    ,23,243,0,64,34,28,24,32,2
    ,128,23,244,64,179,157,99,38
    ,95,237,19
160 *FX4,1
170 DIM M%(19,31),X%(2),Y%(2),MON$(2
    )
    :*FX11,1
180 ON ERROR GOTO 810
190 MODE 2
    :VDU 23;8202;0;0;0;19,8,1;0;19
    ,9,7;0;
    :PROCINIT
    :SC%=0
    :LIVES%=3
    :*FX12,1
200 SP%=1
210 KRISTAL%=0
    :PROCSCREEN
    :PROCSCORE
    :PROCSOUND
220 KIL%=0
    :X%=10
    :Y%=0
    :P%=0
```

Turn to Page 192



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A) MICKEY THE MONKEY and his apple tree make subtraction fun.
B) COLOUR BLOCKS bring sizes and colours into perspective.
C) MERRY MUSIC turns the keyboard into a musical keyboard.
D) FUNNY FACES presents a line up, which one is the suspect?
E) FRED THE FROG needs co-ordinated help to get across the pond.

EARLY YEARS 2
A) THE POND seems very active today.
B) SPEED is required to keep the cake on the conveyor belt.
C) DIRECTIONS seem to be needed by everyone in Orion village.
D) ORDER the blocks.
E) SID THE SPIDER needs some help to get out of the maze.

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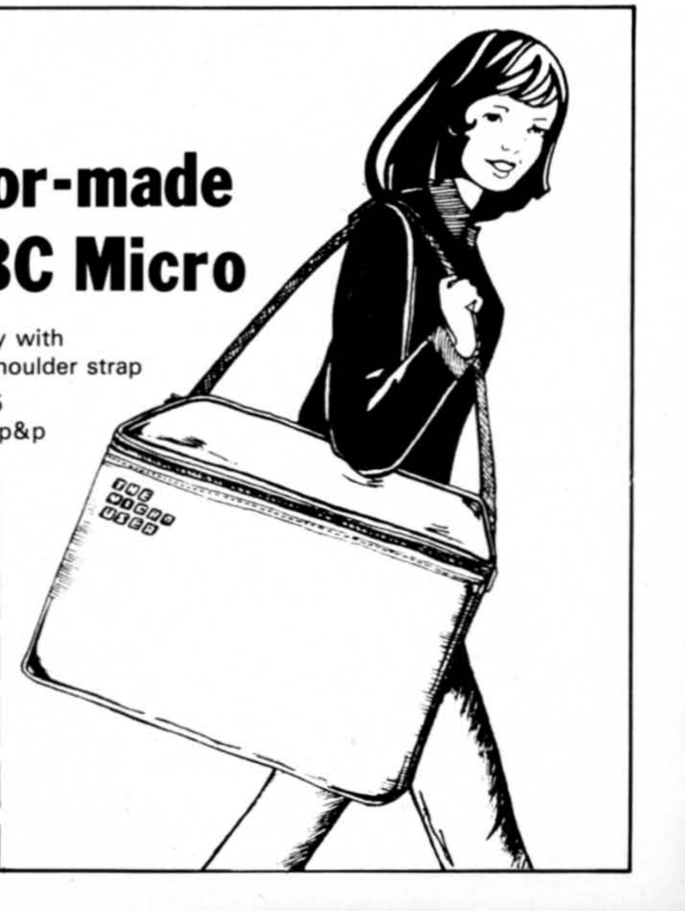

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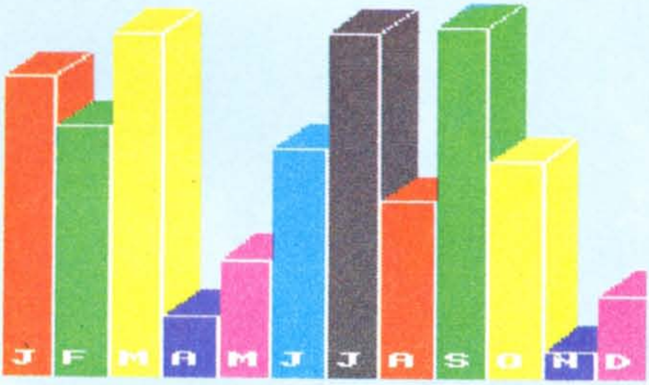

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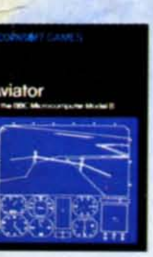

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MIKE COOK'S PROBLEM PAGE

Fitting Wordwise ROM – without 'Bad command'

I WOULD be glad if you could help me as I am having problems with fitting a Wordwise ROM chip to my upgraded Model A BBC Micro.

I haven't got the full fitting instructions but was told that I should remove the Basic ROM from position 2 and put it in position 5 and put Wordwise in position 2 as below.

OS Rom	Word wise			Basic
1	2	3	4	5

But when I do this it comes up in Wordwise.

It says Old text (Y/N) – put 'N' and get into menu mode.

But then when I type in *BASIC it gives me "Bad command".

I have tried Wordwise in position 5 and Basic in position 2, but I get a "Bad command" when I try to access Wordwise with *W.

I have also tried Wordwise in position 2 and Basic in position 3, and the reverse, without success.

I thought that the operating system scanned the paged ROMs from 5 to 2, so the first method I used (with Basic in 5, and Wordwise in 2) should have come up in Basic.

I would be very pleased if you could explain this to me, as I have moved the ROMs so many times that I am worried about damaging them.

I saw Chris Martin's article in your magazine in July 1983 but found the directions rather confusing. – *Penny Holden, Bury St Edmonds.*

● **For such a long letter there is fortunately a short reply.**

The links S12 and S13 located where the keyboard cable joins the main printed circuit board have not been snipped.

Thus only one sideways ROM socket can be enabled. Snip these and it should work.

Interfacing a printer

I have a BBC Model B computer and a Data Dynamics 390 RO (receiver only) printer. This is a 20mA current loop printer.

The BBC manual states that it is not possible to interface directly to this type of printer.

Is it possible to buy or make a suitable interface to run it off the BBC Micro? If so, could you tell me where I might obtain the appropriate circuitry? – *C.M. Ashley, Knutsford, Cheshire.*

● **The circuitry itself is not much of a problem but a 20mA current loop supply requires about 180 volts for full spec performance.**

You might be able to modify your printer by removing the resistor in series with the actuator coil.

If you can do this then a simple circuit using a power FET to switch the current might work.

But you are then faced with the problem of speed. It is more than likely that your printer works at 110 baud but the BBC Micro is not designed for these speeds.

Some mods could be done to achieve this speed, but you lose the use of the cassette system. All in all, probably not worth the effort.

Altering the volume

A recently purchased BBC Model B (OS 0.1) is causing me a problem with a difference.

In my case, the sound is extremely loud, especially when used for games.

Is there any way I can reduce the sound volume short of returning to the manufacturer? – *Edward Martin, Rothesay, Scotland.*

● **Open the lid of your computer and remove the keyboard. You should see a small plastic block in the bottom left hand corner of the main printed circuit board. In there is a screwdriver slot. This can be used for altering the volume produced by your micro.**

On line at a time

THE first computer I used was a Pet. One of its facilities was TRACE ON and STEP. With this facility I was able to find out what my program was actually doing rather than what I thought was going on.

I now have a BBC Model B. Still being unskilled at programing I find I need the TRACE on. But even when using Ctrl and Shift I cannot as yet slow down the program to one line at a time.

Can you help by telling me how or if there is a program available to cope with this problem. – *G.K. Gifford, Southampton.*

● **Use TRACE ON, but before you do, Ctrl-N. This will stop the screen scrolling and so allow you to see what has happened. However we think your time would be better spent thinking about what is happening rather than resorting to the TRACE command.**

You've got a problem with your micro and you just can't sort it out on your own? Then write to MIKE COOK. If he can't help then probably no one can . .

Checking your DIY

WHEN I bought my machine, a second-hand plain old Model A, I decided an upgrade was needed.

I sent off my hard earned cash for a complete DIY "A to B" kit.

This duly arrived, and with my trusty soldering iron I upgraded it.

Once switched on the micro displayed the required "32k" and all software worked perfectly.

However as I did the upgrade myself, and as I don't own a printer, etc., I cannot be sure if all my soldering on the RGB, analogue, user port and so on was successful, and that's where you come in, I hope.

Are there any programs, instructions or details available that I can key in to check these additions?

I hope that you can sort this problem out and that the

→

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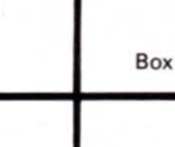

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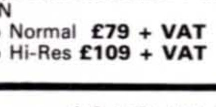

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From Page 123

solution may also be of use to other readers. – *Allan Dunn, Glasgow.*

● **THERE is no way of testing these additions until you come to use them. This is because there is no feedback from the end of the connector back into the computer.**

It's just like posting a letter – you have no idea if it has arrived until you receive some feedback.

Call for the TV man

I HAVE a BBC Model B and was interested in your reply in the January edition to a reader who was having problems with drifting patterns across the screen – especially evident when large areas of a single colour are used.

I get similar effects when running the Acornsoft Snooker game.

The green table is continually traversed by wavy lines, giving a dirty picture.

You suggest altering the trimmer near the colour burst crystal.

I have assumed that this trimmer is the small circular component about a quarter inch diameter in the centre of which is a slotted screw.

Nearby are components marked 17.7345 mHz and R131.

I have tried altering the setting of the trimmer by 180 degrees in both directions, but it seems to have no effect.

Finally I returned the trimmer to its original setting.

Can you offer any further advice please? – *K.W. Biggs, High Wycombe.*

● **To get the colour information onto a TV signal – as opposed to an RGB monitor – it must be modulated.**

This is done at about 4MHz and this carrier frequency is introduced onto the colour signal.

At the TV end there is a notch filter to take out this frequency. If it is not removed you will get the colour patterning you complained of.

This could be due to either bad adjustment or poor design of your TV. The adjustment is quite easy to make. The only snag is finding the colour subcarrier trap as it is called.

The best bet is to call in a TV engineer and get him to adjust it while displaying a computer signal.

If the adjustments have no effect then it is the design of the TV set that is at fault and I am afraid there is not much that can be done.

The problem is that colour TV sets were never designed to be used with computers and as such are not tested on them.

This problem could just be one of component tolerance and it is likely that an identical set would give much better results.

Planetoid explained

I HAVE a slight problem concerning the loading of one of my programs on the BBC.

The game is Planetoid by Acornsoft, and when I try to load it it always gives a "Searching" message at the value of 20, during planet 2.

It then shows value 21 and 22, with its hexadecimal value, and continues until it shows V2.0. 00 0000.

I will be most grateful if you could give me an explanation of the matter.

– *D. Smith, London.*

● **This one is simple – your tape is faulty.**

There is probably a bit of damage on the tape or a spike has been recorded on it by accident.

Alternatively the tape could have been damaged by a magnet coming into close contact with the cassette.

In any event if you take it back to the dealer you bought it from he should replace it.

Blue block mystery

AFTER reading your reply to a letter in the October issue of *The Micro User* (page 113), I opened up my BBC Model B to turn down the volume.

On the left hand side just above the user-defined keys, I found a blue plastic block and used a screwdriver to turn the screw inside. This had no effect on the volume.

Underneath the keys, however, was an off-white block containing a black screw. This turned the volume down.

Can you tell me what the blue block does and how to tell it is correctly adjusted, since I have altered it by turning the screw? – *N. Spooner, Rye, East Sussex.*

● **Yes, the colour of the volume control does vary depending on where the computer was made. What you altered first was the clock frequency control of the speech synthesiser.**

If the synthesiser is fitted you will find that the pitch of the voice has altered, possibly giving a Donald Duck effect.

As you probably have not got a synthesiser fitted you don't have to worry. This control needs to be set up for each chip, so has not been preset.

Full details of how to adjust this are given in the speech synthesiser user manual.

Why do they do it?

IT'S come to my notice that more software firms are stopping and starting the cassette motor while loading.

I generally leave my remote jack out to prevent this happening.

At first I thought that it was switching on and off so fast that the motor wasn't actually stopping, but now I have my doubts.

I am sure that the software firms would realise that the motor could burn out with this constant stop-start command and so maybe it's okay, but I would like your opinion.

Why do they do it? Is it another method of preventing copies? – *B.E. Pritchard, Madeley, Salop.*

● **I am not sure what you mean. The cassette relay is quickly pulsed at the end of each block but this is done by the operating system and not the software.**

Normally the cassette motor will not stop, as the pulsing is so rapid.

I cannot think of any way of protecting software by rapidly switching this relay on and off.

Three (or four) cheers for Mike!

I WOULD like to say how I enjoy *The Micro User* especially Mike Cook's articles for which I give three cheers.

I would make it four if I could make his ideas work.

For instance, the relay will switch a sewing machine on or off but not control it.

I was hoping to stitch 1in or 1cm long from the keyboard, or with the light pen. – *M. Hardy, Tyne and Wear.*

● **With respect it was not my idea to control a sewing machine. A computer can turn things on or off quite easily.**

Now assuming that you have connected the control to the switch that turns on the sewing machine motor you can turn it on, and then after a fixed time turn it off again.

The motor should have then done a certain length of stitching. You can then calibrate the length of time the motor is on with the length of stitching required.

This is not usually satisfactory as the length of stitch depends on a lot of other factors. What you really need is some form of feedback sensor that would report back to the computer how much stitching has been done.

This is what I call a non-trivial task. It can be done, however, and I am sure you will learn a lot in the process.

When you succeed you have the material for a very good article. I do hope you will give us first refusal on it.

IF you have a technical query for this page, send it to Mike Cook, *The Micro User*, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.

Letters on other subjects should be sent, as usual, to Micromail, which this month starts on Page 209.

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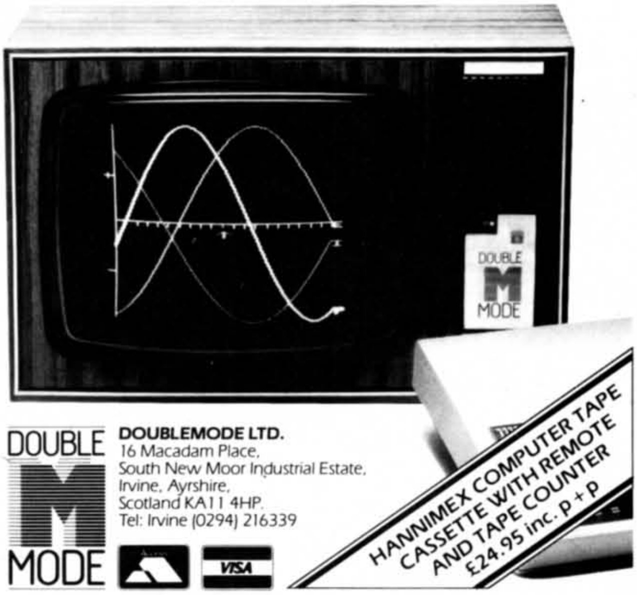
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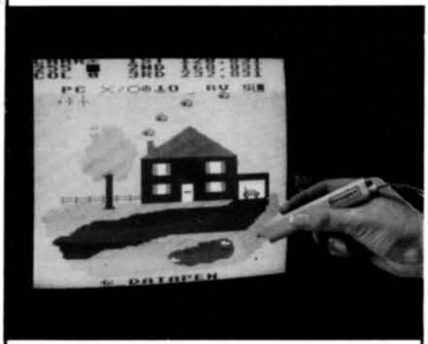

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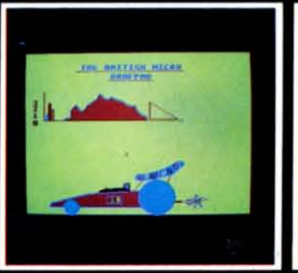

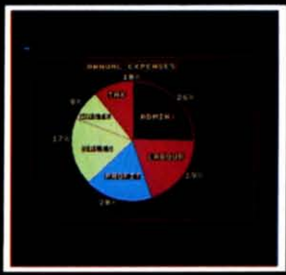

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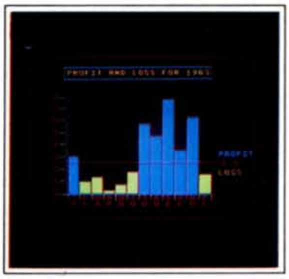

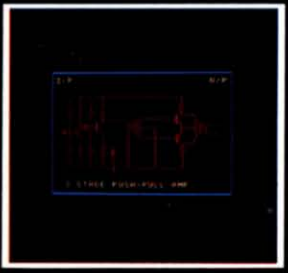

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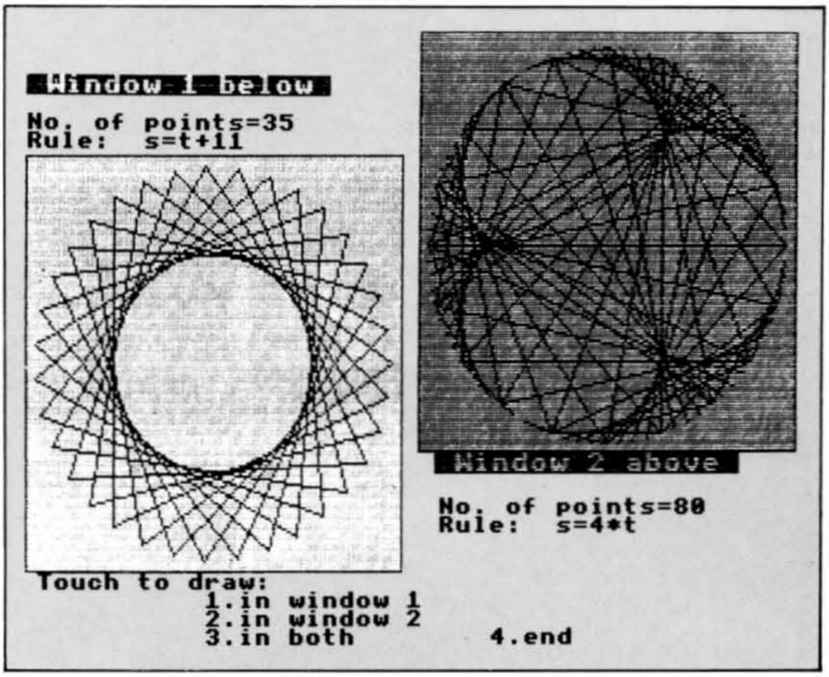
Peering through the BBC Micro's many, many windows!



```
Window 1 below
No. of points=35
Rule:  s=t+11

                         Window 2 above
                         No. of points=80
                         Rule:  s=4*t
Touch to draw:
           1.in window 1
           2.in window 2
           3.in both          4.end
```

Figure I

By DAVID TALL

THE BBC Micro has the valuable facility of being able to define separate text and graphics windows. But on first acquaintaince it seems only one of each is available at any one time.

A greater number can easily be simulated by setting up a switching procedure and jumping almost instantaneously from one to another.

For example, the sample layout in the picture has two graphics windows and three text windows – See Figure I.

Each of these may be set up by the appropriate codes which in Mode 1 are as follows:

TEXT1	VDU28,0,7,19,0
TEXT2	VDU28,21,27,39,20
TEXT3	VDU28,0,31,39,28
GRAPHICS1	VDU24,4;132;628;756;
GRAPHICS2	VDU24,648;390;1272;1016;

(The VDU codes are explained on pages 385-389 of the User Guide)

Switching from one window to another can be done by procedures such as PROCgraph(N) and PROCtext(N) in the demonstration program SpiroTwo.

PROCgraph(N) selects graphics window N (for N=1 or N=2) and also includes a VDU29 command to alter the graphics origin to the middle of the window selected.

In switching from one to the other the picture remains unchanged until a graphics command is issued, such as PLOT, DRAW or CLG.

My preference is to draw a rectangle as a border just one pixel outside each graphics window at the beginning of the program (in SpiroTwo this is done in PROCinitial_values.)

Clearing the current graphics area will then leave the border unchanged, creating the illusion of permanent graphics windows on the screen.

The corresponding switching procedure PROCtext(N) changes the text area and homes the cursor to the top left-hand corner of the selected window.

I have also taken the precaution of clearing the new window with CLS before writing in it.

The multi-window facility is illustrated by a pretty line drawing routine show to me by William Wynne-Wilson of Birmingham University. I have adapted his idea by drawing two versions in separate graphics windows.

If you type the program into your own micro note that the line numbers are in tens to allow use of the AUTO numbering facility – just type AUTO followed by Return and enter the lines

‘The answer lies in almost simultaneous switching’

as they come.

Lines between procedures consist of a single space to highlight the program structure. You can miss these out if you like.

The program layout is very simple. After PROCinitial_values has set up the starting position, the main routine repeats the procedures PROCchoice, to select the windows, and PROCwindows, to modify and draw the figures in the appropriate graphics areas.

PROCchoice is offered in the bottom text area on the screen. Touching 1 or 2 selects the corresponding window, 3 draws in both simultaneously and 4 ends the program.

The idea of the program is to imagine equal spaced points round a circle and to join them in pairs. You may specify the number of points and the rule by which they are joined.

The points joined are numbered t and s and you can specify the rule (in Basic) which relates them.

For example, the first window has 35 points and the rule is s=t+11. Thus if t=1 then s=12, and the first point will be joined to the twelfth; if t=2 then s=13, joining the second point to the thirteenth, and so on.

Should the calculated value of s be bigger than 35 it is simply a matter of counting on round the circle, so the 36th point is the same as the first and the 37th is the same as the second.

In window two the starting rule is s=4*t with 80 points round the circle. If the program is RUN and option three taken, then both pictures will be drawn simultaneously.

When playing with the program it is interesting to try other rules and different numbers of points. For instance you might try s=3*t or s=5*t with 100 or 200 points round the circle, or more complicated rules such as s=t^2/20.

The program allows one picture to be retained and the other modified, or both can be changed at the same time.

Given the ideas, programmers will soon modify them to suit their own needs. For instance, replacing numbers in the coordinates would allow the windows themselves to be moved around. A nice touch is to include colour changes in the switching procedures so that each window has its own initial colouring.

A less obvious idea would be to have some of the windows overlapping, or one window contained in another. For instance, you could add to PROCtext(N) the instruction:

ELSE IF N=4 THEN
VDU28,31,39,30.

The text area for N=4 would then be the bottom two lines of text area 3. PROCtext(4) would have the effect of leaving the top two lines of text area 3 fixed and scrolling the bottom two lines.

‘A text window need not contain text only’

An extension of this idea might be a table of values which the user is able to modify.

The screen could be laid out in a large initial text area with each value in a small rectangle which could later be used as a text window. It would be possible to call up each text window for input or printing without overprinting anywhere else.

Remember also that a text window need not contain text only. Any suitable rectangular area of the screen may be designated as a text area and scrolled for special effects.

Alternatively a text area could have a graphics window superimposed to allow graphics to be added at a later stage.

Should you wish to experiment with the demonstration program it is designed to leave the windows on the screen when it ends.

Type MODE 1 to get rid of them, or include a mode statement just before the END of the program.

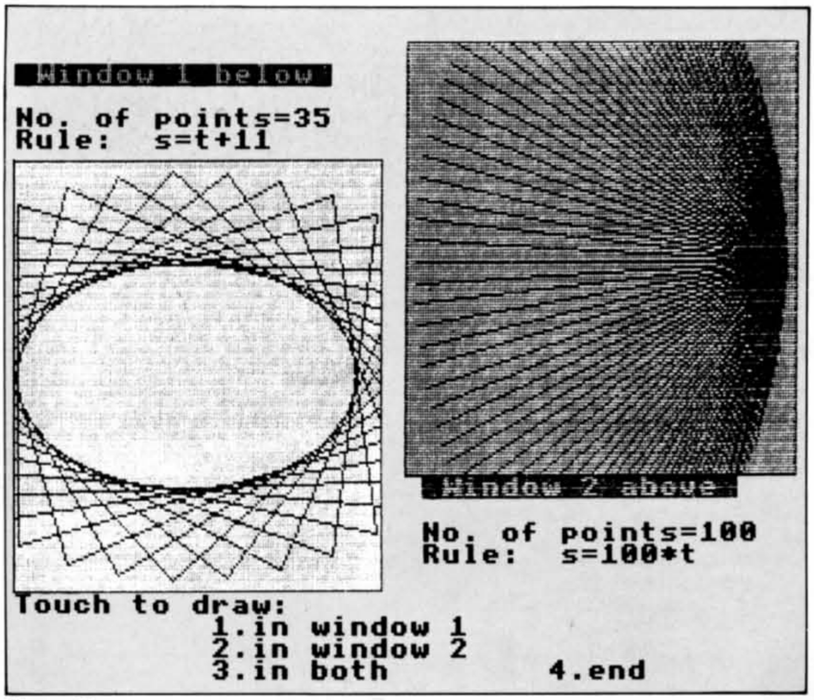
You might try typing PROCtext(1) and LISTing the program to see what happens, or typing PROCgraph(1) or PROCgraph(2) and then CLG to clear the selected graph window.

The perceptive reader will see that much of the effect could be achieved in the program without changing the graph areas at all.

However if the variables a(1), b(1), a(2), b(2) are made slightly larger then the pencil of lines will pass beyond the borders of the graphics areas. For example a(1)=500, B(1)=300, a(2)=300, b(2)=500 would give elliptical shapes in both windows, part of which is outside each rectangle.

Make these changes and RUN the program again. You will see the lines cut off at the border and not going outside the window (Figure II), graphically demonstrating the beneficial facility of using more than one window on the screen at a time.

Listing starts on Page 188

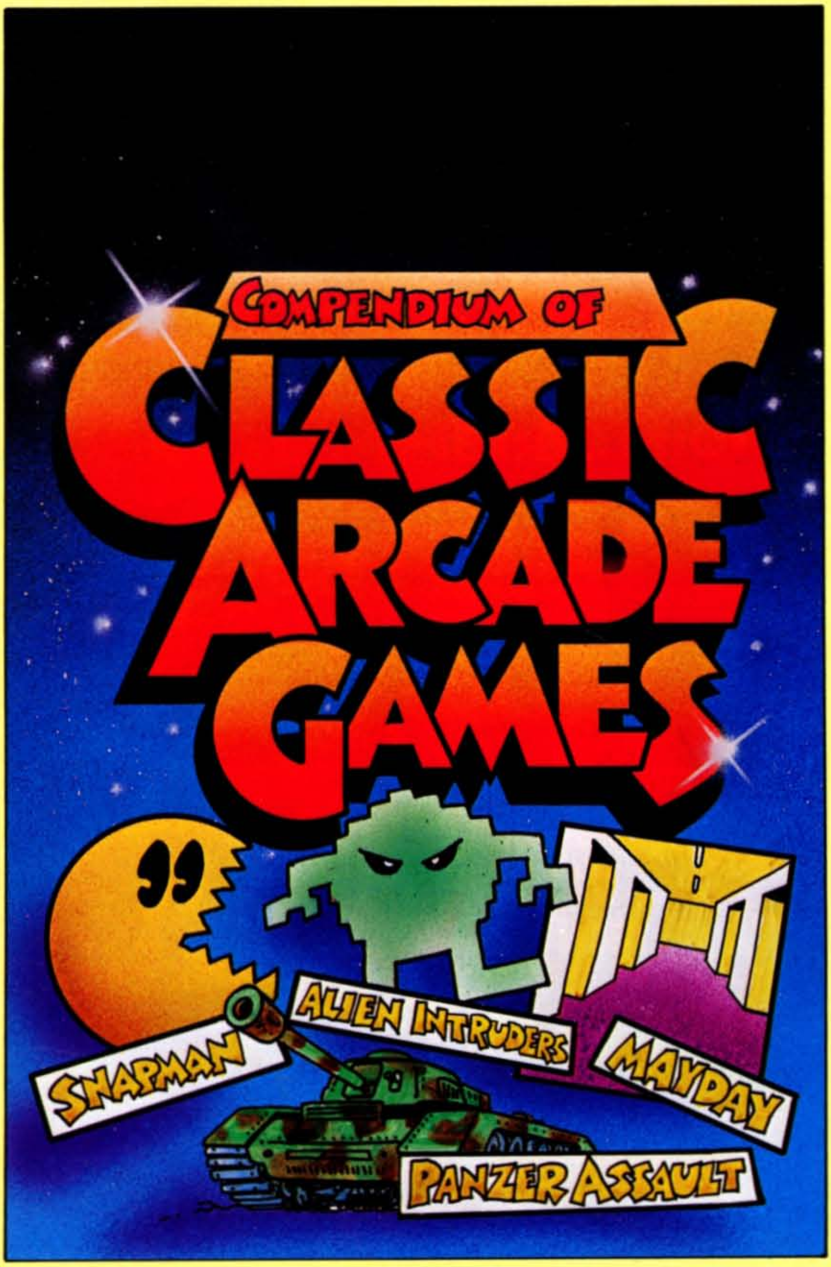


```
Window 1 below
No. of points=35
Rule:   s=t+11

                                 Window 2 above

                                 No. of points=100
                                 Rule:   s=100*t
Touch to draw:
           1.in window 1
           2.in window 2
           3.in both           4.end
```

Figure II

Here's something SPECIAL from

THE MICRO USER



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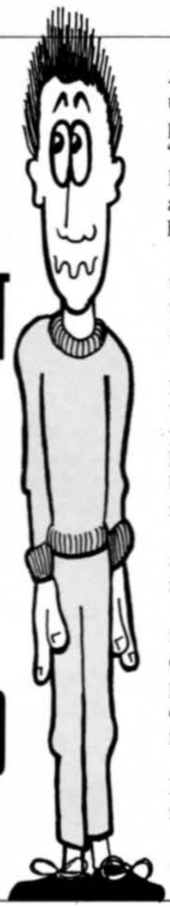

A DISC interface on the BBC Micro uses part of the RAM. With many programs, particularly those using the "memory eating" modes, you can LOAD them but, when you RUN them, as soon as the program tries to enter the hi-res modes it runs out of space.

The space the disc interface uses is at the bottom of RAM, taking up part of the memory that would normally be available for programs.

However, once we have loaded the program from disc there is no need to waste this space. We can copy our program down from where it has been loaded to a new position at the very bottom of RAM, overwriting the memory that the disc system takes up.

The program now has available to it as much memory as if it had been typed in or loaded from tape.

Moving the program down in memory like this is known as downloading. It only takes a small program to do this. I attach my downloader, called MOVER, to a function key.

When I want to download a program I first CHAIN "MOVER" to set up the function key.

Nothing spectacular happens, and I do not, at this stage, press the function key – after all, I haven't got the program I wish to download in the micro yet!

I then LOAD the program I want and follow that by pressing the function key. This brings the downloader into operation.

After a short pause the cursor returns, showing that downloading is complete and I can now RUN the program.

Incidentally, we've come up with a rather unusual problem in our downloading: The Acorn DFS insists on altering just one byte of a downloaded program.

You can get away with running the program once, but the next time that altered byte will crash the program unless you're lucky.

To get round this, at the beginning of the downloader I've added *TAPE to negate the influence of DFS. Listing I contains the new version.

Mike Bibby

```
1 *KEY0 *TAPE|M N%=PAGE-%E00
  :FOR L%=PAGE TO TOP STEP 4
  : !(L%-N%)=!L%
  :NEXT
  :PAGE=&E00|M OLD|M
```

Listing I: Mover

PAEAN systems

PROGRAMS FOR BBC MODEL B/ELECTRON*

Quebec Marketing MU, Little Bealings,
Woodbridge, Suffolk IP13 6LT.
Tel: Ipswich (0473) 623757

NEW

DELIVERY £7.50

Drive yourself mad around this maze adventure. You will have to stay pretty cool to avoid trouble, cope with a myriad of hazards, not to mention a bolshy mate, and get your deliveries right, all at the same time. The Law is never far behind . . . so watch out!
Full scoreboard. Optional sound. Keyboard.

SCAN* £7.50

An original card based game of great subtlety. The idea is to place 25 of your 26 cards in positions which equal or are greater than the value of the computer's cards. Excellent graphics include clues about the suits and values of the computer's hidden hand – you must be very shrewd to win the maximum 40 tricks. Keyboard.

NEW

TELEWRITER
Mode 7
Text/Graphics
Manipulator
UTILITY

TELEWRITER £9.50

A suite of programs comprising
Telewriter -Main editor
Teleflip -Displays up to 20 pages of data
Teleload -Allows inserts to other programs
Demo_Ten -Demonstrates 10 pages of data to play with

This is a powerful utility which gives the serious user easy domination over the BBC's extensive Mode 7 capabilities. Comprehensive manual.

NEW

SLIDER
Synchronises a
film slide
projector with
a taped
commentary
UTILITY

SLIDER £8.50

This utility synchronises a single slide film projector with a pre-recorded tape commentary or music background. A slide projector with remote control is required. Programs allows up to 999 slides to be controlled for variable display times. Applications for lecturers, photographers, architects etc. and micro film users. Instruction manual.

Light Cycles

LIGHT CYCLES £7.50

A fast reaction game for the fleet of hand and mind. Can you surround the enemy with your light trace and make them crash? The better you are, the more cunning and numerous the enemy become. Simple and infuriating. Full scoreboard and sound. Keyboard.

MORSE INSTRUCTOR £5.95

This program teaches the Morse Code: Character to Morse, Morse to Character. Random character group sequences and 36 word passages provided at a choice of 8 speeds. Limited facilities to simulate transmission using the keyboard.

SHIP LIGHTS GUIDE £5.95

Recognition of ships' lights from three aspects, ahead, abeam, astern. A program designed to assist users in fast identification in conformity with the International Collision Regulations and to test knowledge at a primary or advanced level.

ALL PRICES ARE FULLY INCLUSIVE

We always require good programs on general or specialist subjects for the BBC or Electron.

EBUG £8.50

This Utility allows the examination and alteration of all memory locations from &E00 to &FFFF(except MOS). Simple Edit/Transfer capability for discs or within RAM. Straightforward instructions.

EUROPE £5.95

Detailed map of Europe with 9 sections of 25 questions each covering Capitals, Countries, Rivers, Seas, Populations, EEC & Warsaw Pact Countries at 2 levels. Ability to plot and calculate distances between any two points. Suitable for 8-15 year olds.

AVAILABLE AT GOOD COMPUTER STORES, SELECTIVELY FROM MICRONET 800 OR DIRECT FROM PAEAN SYSTEMS

£285 For a Daisy?

The first quality Daisy Wheel Printer to be sold for under £300. Twelve months warranty – Japanese reliability. 180 words per minute, quiet operation – 60dB. 13″ Carriage, 10, 12, 15, characters per inch plus proportional spacing. Parallel, Serial and RS232 interfaces. Quick loading "Clean Hands" ribbon cartridge QUME compatible. Have fun and dance through your printing with our Daisy!

The DAISY STEP 2000 printer.

Video Camera Interface.

BBC CAMERA UNITS

Enables any standard Video Camera to be connected to a BBC or Apple Micro. The image is then displayed on screen ready to be enhanced or manipulated as required. The final image can then be stored or output to a printer, plotter slide or video unit. Resolution is 220x 310 with 64 levels of grey.

Price	**£174.00**

BBC SEESCAN VIDIOGRAPHIC UNIT

A VIDICON TV CAMERA with a built-in Z80A microprocessor enabling documents and images to be input directly from camera to computer. They can then be enhanced, edited, manipulated stored on disc/tape or output as normal TV/Video signals 220x312 resolution 64 grey levels. Another technological breakthrough from Cambridge at a bargain price.

PAINTBOX-COMPUTERS,

University Graphics Centre, 37 University Road,
Southampton. Telephone: 0703 558621

Prices exclusive of VAT and Carriage

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Fitted with:-

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We have a wide range of graphic software for Designers, Artists, Illustrators, Photographers, Engineers and Architects. Computer Holidays – Learning at Leisure

Carriage:- Printers £8. Other items £6.

3D-TANKZONE
sensational NEW release!!!

For BBC 32k ***£8·95***

At last, a stunning interpretation of the 3D Wire-Graphics Tank Battle simulation you've all been waiting for brought to you by Dynabyte.

Features include anti-tank missile launcher with realistic 'shell-in-flight' action, radar screen, detailed control panel, anti-aircraft and anti-tank modes (with options to choose one or both), hidden line removal, exploding tanks and many other special effects. There is NO other game like it.

DYNABYTE EXPLOSIVE **Software**

Availiable now at all good computer shops or direct from

DYNABYTE SOFTWARE
31, Topcliffe Mews, Wide Lane, Morley
LS27 8UL. Tel: 0532 535401

POOL **£7.95**

Exciting pool hall action all the way in this 2-player game of skill. Excellent ball control and smooth graphics an outstanding feature of this program.

BBC and Electron versions (Machine code 32k)

CORPORATE CLIMBER **£7.95**

Avoid the eager taxmen in the lifts ready to hinder your climb to power and beware of too much stress resulting in high blood pressure.

BBC and Electron versions (Machine code 32k)

HORSERACE **£6.95**

All the excitement of the track brought to your own home in this colourful game complete with tumbling jockeys, realistic horses, TV van, tote and leader boards, waving crowds and much more. Suitable for 1-6 players.

BBC and Electron versions (Basic + M/C 32k)

LEMMING SYNDROME **£7.95**

Save the panicking population in this highly original game full of special features and options designed to make your task harder as you get better.

BBC and Electron versions (Machine code 32k)

15
CORPORATE CLIMBER
LEMMING SYNDROME

Disc versions available please add £3 per program.

SAE for catalogue.

(All programs require O.S. 1.2)

Please state BBC or Electron when ordering and include 50p P&P

Use JIM NOTMAN's function key command strip . . .

Take the toil out of typing in your programs

THE INCORRECT use of spaces can create problems when typing in programs. BBC Basic, with its long variable names, is much more particular about where spaces occur than simpler Basics.

The computer must be able to determine where the variable name ends and a keyword begins.

In general, if a variable name does not have a "delimiting" character such as $ % =>< + / * – , ; or : after it, there should be a space. Otherwise "No such variable" error may result.

Spaces are not required after keywords, though (if the syntax allows) it does make the listing more readable.

For easier readability, many of the listings printed in *The Micro User* use our special formatter. When inputting these listings, do not press RETURN until all the statements from that line number have been typed in. For example:

```
100 IF letter <> line end
    THEN PRINT "continue typing"
    ELSE PRINT "Press Return" <RETURN>
110 NEXT program_line <RETURN>
```

In some of the listings you will see some numbers enclosed in brackets and underlined after PRINT statements, such as:

```
PRINT "<129>Red"
```

In this case the line includes the teletext control character 129 which makes the rest of the screen line red. These codes can be input directly from the keyboard (NOT with OS 0.1) by using the function keys with combinations of the SHIFT and CTRL keys.

If any program which uses the function keys has been run, say Wordwise, it is best to reset the BBC with CTRL BREAK.

Before the function key command strip on the edge of the page can be used type in:

```
*FX227,140
*FX228,150
```

This allows all the important control codes to be generated and the function keys can still be programmed with strings as usual.

Before typing a program try:

```
REPEAT : PRINT GET : UNTIL 0
```

with the function keys, to see that you are really producing the expected codes.

When using codes 150 to 159 by holding down the CTRL and SHIFT keys and pressing a function key, line scrolling will be prevented until the SHIFT and CTRL keys are released.

It is sometimes a little confusing using the double height character 141 (&8D). Try:

```
AUTO <RETURN>
10 PRINT "<141>Hello" <RETURN>
```

When the cursor reappears the next line number is no longer visible as expected. If you now use the cursor to move up to line 10 and copy the line with the COPY key, you'll notice that PRINT cannot be seen on line 20, but that when Hello is reached you'll see the double height Hello.

This rather strange effect is due to the way the teletext character generator works.

	f0	f1	f2	f3	f4	f5	f6	f7	f8	f9
SHIFT	nothing 128 &80	A. Red 129 &81	A. Green 130 &82	A. Yellow 131 &83	A. Blue 132 &84	A. Magenta 133 &85	A. Cyan 134 &86	A. White 135 &87	Flashing 136 &88	Steady 137 &89
CONTROL	Normal Ht 140 &8C	Double Ht 141 &8D	nothing 142 &8E	nothing 143 &8F	nothing 144 &90	G. Red 145 &91	G. Green 146 &92	G. Yellow 147 &93	G. Blue 148 &94	G. Magenta 149 &95
SHIFT CONTROL	G. Cyan 150 &96	G. White 151 &97	Conceal Dis. 152 &98	Contig. G 153 &99	Separate G 154 &9A	nothing 155 &9B	Blk Backgnd 156 &9C	New Backgnd 157 &9D	Hold G. 158 &9E	Release G. 159 &9F

THE MICRO USER

Get ready for MICROWEB

NEXT month sees the launch of Microweb, a Bulletin Board exclusively for readers of *The Micro User*.

Microweb is the first electronic message service dedicated to the BBC Micro. We're determined that it's going to be the best Bulletin Board in Britain – and with your support it will be.

A simple telephone connection will give you the latest ideas, news and gossip in the world of the BBC Micro.

And it's not going to be one-way traffic. You'll be able to send us your own views, ideas and program queries.

Not only that, but you'll be joining in an elite band of BBC Micro enthusiasts, each as determined as you to get every ounce of enjoyment and excitement out of his BBC Micro. At Micro User we're bubbling over with enthusiasm for exploring this new field.

For us Microweb is the start of a big new adventure. We hope you'll share it with us.

Here's a great free contest to get you started!

Your key to the

GETTING one micro to talk to another is the latest and most exciting application of micro computers. And you BBC Micro is ideal for it.

From your own home, by simply linking your computer to the telephone, you can communicate with other micro owners, bulletin boards and even large mainframe computers all over the world.

This month's competition offers a unique double package to get you

A reader in New Guinea is contest winner

The winner of our February competition was Richard Dryden, of Papua, New Guinea. His description of using a Beastie to simulate a bird's wing was so exceptional that we've decided to let you see it in detail. He writes:

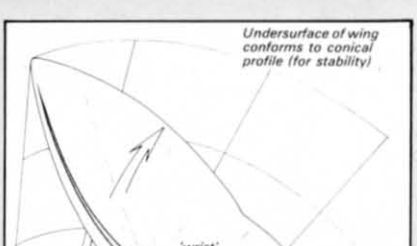
FLAPPING-wing flight has fascinated me for years. Just how do birds, bats and insects do it? I see this as one of the great gaps in our aeronautical knowledge.

We are quite competent at building aircraft with rigid wings and howling motors to push or pull them through the air. But flapping flight is different.

The wings have to provide both lift and propulsion. This requires a controlled degree of structural elasticity to prevent the wings flinging themselves apart.

The main problem areas in studies of flapping flight are:

- ***Aerodynamics:** Producing wings with the right kinds of changing geometry to produce thrust and lift.*
- ***Structure:** Designing a "soft" or elastic wing strong enough to withstand the forces exerted on it.*
- ***Power supply:** Finding a suitable power source to drive the wings, particularly during the downstroke.*
- ***Control:** How to alter the properties of the wing in a controlled way to initiate and limit manoeuvres.*



GENERAL ARRANGEMENT OF WING

It is the last category – control – that I feel could be usefully explored by a robotics approach.

Although the structure of a wing can be designed in such a way that it responds "intelligently" to changing patterns of force by flexing appropriately, there needs to be on top of this, a finer control of changes throughout the wing.

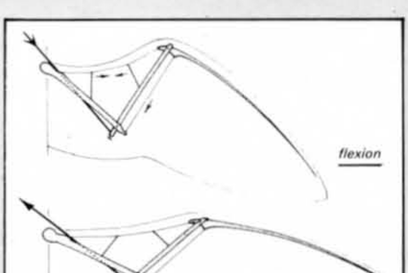
Otherwise flight soon becomes catastrophically unstable – as I have found out the hard way by picking up the pieces of numerous models.

I propose to build a mock-up of a flapping wing, with servo-control of two parameters initially:

☐ *Overall extension of the three main joints in the wing.*

☐ *Degree of pronation/supination of the "wrist" joint in relation to the inner part of the wing.*

The accompanying diagram should help to make this clear.



The model wing could then be tested for its response and controlability under aerodynamic loading. I shall have to improvise by having the rig attached to a moving car.

The great joy of having the servos under BBC Micro control would be the possibility of programming sequences of quite complex changes in geometry without having to cope with them manually in real time.

They could be carefully planned before the test and repeated accurately as many times as required.

This potential for precision and repeatability would offer a much greater possibility of modelling the movements of a bird's wing.

MICROWEB

...find out more about this exciting venture in next month's Micro User

world...

started in this fascinating area, in which thousands of micro enthusiasts have already become thoroughly hooked.

Firstly, the winners – and there are three prizewinners this month – will be receiving Pace's Grapevine modem.

This interfaces your micro to the telephone network so you can transmit and receive the electronic signals that carry your messages.

There are all sorts of different standards for the signals. But don't worry, Grapevine will handle all you need.

Actually programming your micro to handle them can be a little tricky though. That's where the second part of the prize package comes in – Commstar.

This is an extremely clever piece of ROM-based software that lets you turn your micro into a terminal – that is, the sort of computer needed to send and receive the signals.

Commstar gives you two standard terminal "settings", one of which allows you access to Prestel. However the software makes it simplicity itself to tailor your terminal to your own requirements.

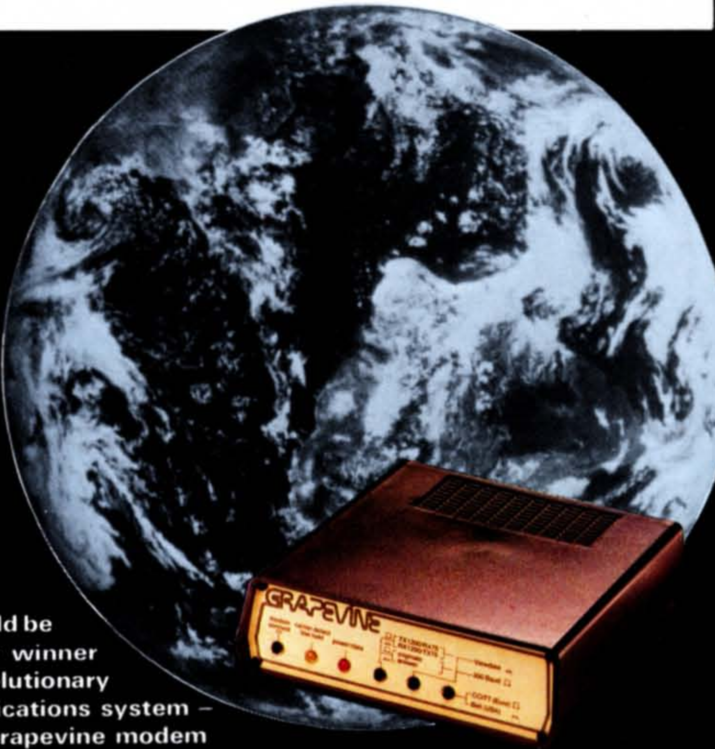
All you have to do to win this dynamic duo is to come up with as original a use for the combination as possible. The possibilities are endless!

Just think of it. You can send messages, data and programs anywhere in the world, almost instantly. How would you use it?

Once your imagination is fired you'll come up with lots of ideas.

Send us just one of your ideas, in not more than 100 words, on the coupon below. You could find yourself with both the hardware and software to put it into practice.

But remember – we have to receive your coupon no later than May 31, 1984.



YOU could be the lucky winner of a revolutionary communications system – Pace's Grapevine modem PLUS Commstar software!

YOUR FREE ENTRY FORM

If I won Pace's Grapevine modem and the Commstar software, I would use it to: *(not more than 100 words).*

____

____

____

____

____

____

____

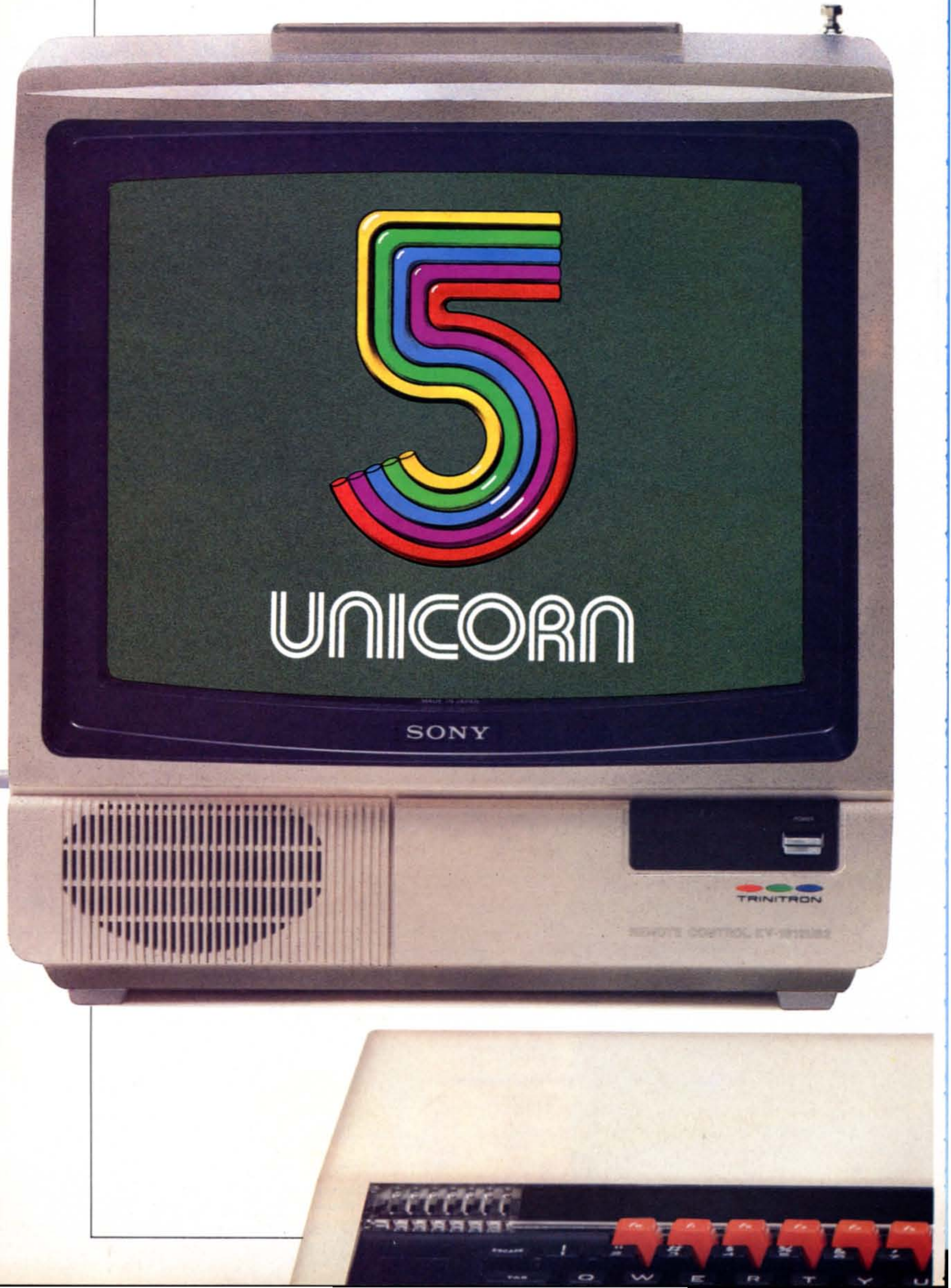
____

Name__________________________

Address________________________

____

POST TO: Modem Contest, The Micro User, Europa House,
68 Chester Road, Hazel Grove, Stockport SK7 5NY.


5
UNICORN
SONY
TRINITRON

Unicorn opens 5 new channels for the BBC.

The BBC Model B micro packs a lot of potential. As a basic computer, it is reliable, efficient and simple to use – but, more than that, it is the first step on the road to a complete computer system.

TORCH COMPUTERS have chosen the BBC micro as the heart of their open channel system – UNICORN. UNICORN means a wide choice of upgrade channels to transform your BBC into a complete business system, a fully communicating workstation, or a high-powered 32-bit data processor.

At the gateway to the Communications Channel is the UNICORN ZEP100 – a 64K processor board and the software needed to promote your Model B into a TORCHNET local area network station. Further along the channel, the UNICORN FDP240 will provide twin 400K floppy disc drives, which with the addition of the ZEP100 will result in a Z80 disc pack.

The UNICORN Business Channel develops the BBC micro into a flexible professional tool equipped to manage the most complex business requirements. Opening with the HDP240 – a simple but powerful disc drive, the channel provides for any level of upgrade from the well-proven ZDP240 (TORCH Z80 Disc Pack) up to the ultimate addition – the UNICORN – combining the HDP68K – a 32-bit 68000 processor with the UNIX® operating system.

And if you get lost in the by-passes and flyovers around your BBC, there is one simple route for you to follow – the straight channel to your nearest TORCH UNICORN dealer. He will assess your requirements, then recommend the ideal solution to cope with your present and future needs.

For full colour product brochure, price list and the name of your nearest TORCH UNICORN dealer, just clip the coupon.

UNICORN

Open channels for the BBC micro.

To: Torch Computers Ltd., Abberley House, Great Shelford,
Cambridge CB2 5LQ. Telephone: Cambridge (0223) 841000.

Please channel further details on the Unicorn range to:

Name ______________________________

Address ______________________________

____

BRITISH BROADCASTING CORPORATION
MICROCOMPUTER SYSTEM

Text and Graphics provided by BBC Model B.
Keyboard provided by BBC Model B.
Disc interfaces are necessary for use with the Unicorn range.

CP/M is a registered trademark of Digital Research Inc.
Unix is a registered trademark of Bell Telephone Laboratories Inc.

SLIMLINE PRECISION

These superbly engineered slimline disc drives for the BBC Microcomputer are unsurpassed in quality and accuracy. They feature direct drive brushless D.C. motors and long-life ceramic read/write heads for maximum reliability, and a die cast alloy chassis which gives rigidity and long term stability. Furthermore, advanced chip technology, using large scale integration permits extremely low power consumption to be achieved.

The Pace range includes drives which are switchable between 40 and 80 tracks. Double sided drives give a massive 400K storage per drive in 80 track mode, whilst in 40 track mode they retain compatibility with all commercially available BBC software. All Pace drives will support double density operation.

PACE disc drives are supplied complete and ready to run direct from the BBC's power supply. They are supplied complete with all cables, a utilities disc, and manual. Pace even supply a blank disc so that the drive is ready for immediate use!

Available from your local dealer or direct from:

PACE
Disc Systems

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Tel. (0274) 729306
Telex 51564

Disc drives available:-

SINGLE DRIVES		
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PSD5	Single Sided 40/80 Track	200k
DUAL DRIVES		
PDD1	Single Sided 40 Track	200k
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PDD3	Double Sided 40/80 Track	800k
PDD4	Double Sided 80 Track Only	800k
PDD5	Single Sided 40/80 Track	400k

Available from good Computer stores everywhere including:
Computer City, Widnes, Cheshire. Tel. 051-420-333. Computerama, Stafford Tel. 0785-41899. Computerama, Stoke-on-Trent. Tel. 0782-268620.
Silicon Centre, Edinburgh. Tel. 031-557-4546. G.T.M. Leeds. Tel. 0532-647474. Wilding Computer Centre, Wigan. Tel. 0942-44382.
National Micro Centre, Stockport. Tel. 061-480-4523. Sir Computers, Cardiff. Tel. 0222-21341. Eltec Computers, Bradford. Tel. 0274-722512.

Non-Volatile RTC and RAM *Acacia*

'RTC and RAM' – a helpful and informative diary

DAUNTED by the prospect of assessing such an elaborately-titled facility, I began gently . . . if I was going to be dropped into a world of strange and complicated terminology then my wish was to be dropped gently.

My fears were unwarranted. I soon learned that what was included in this intriguing package was electronic diary software, RAM filing system software, associated hardware and a full instruction manual, known collectively as "non-volatile RTC + RAM" (RTC standing for Real Time Clock).

I learned further that the term "non-volatile" simply means that any diary entries or system files are not lost whenever the computer is switched off.

I was not only ready, but now intrigued, to read the Acacia manual, where I discovered that RTC and RAM comprise both hardware and software.

The software is held in a ROM fitted into a spare "paged ROM" socket inside the computer. The hardware is supplied in a box, complete with cable links to the computer.

The electronic diary I found to be both helpful and informative. It is also quite easy to get to grips with, with the aid of the list of diary system commands in the manual.

Working through these commands at the computer you are gently and well initiated.

Acacia's method of using a demonstration time or date, for example, which you can then overwrite as you wish, is especially enlightening.

The diary's functions include a continuous display of date and/or time in the top right hand corner of the screen. Alternatively, you can choose not to display the clock until you request the time.

The time and date is kept, even when the computer is switched off. It also takes leap years into account – I am writing this on February 29!

I was particularly impressed with the facility for inserting and displaying reminders. Again it is well explained, with the use of a demonstration example.

The diary automatically "opens" for you on the correct date, immediately outlining all entries relevant to today. On pressing Return, every reminder set for that date and every date after will be displayed successively.

You can change the date of the reminders from which the display begins, to gain a retrospective glance at the appointments you've missed.

Two extras that I found greatly increased the usefulness of the diary are the keyword and wildcard facilities.

The former permits a command which enables you to search out only those reminders which include particular words.

For example, for the regular traveller, typing the command *DIAK AWAY will display all reminders with the word AWAY in them.

Along similar lines, the latter means that words and filenames do not have to be specified precisely. For example, H*T covers all words beginning with H and ending with T.

The actual setting up of the reminders is just as simple. You can enter them for years ahead.

The recommendation for the diary to be used in Mode 7 enables the use of colour in the reminders, perhaps not totally necessary but nevertheless an added bonus. I found a red flashing reminder definitely had more impact, sending me scurrying off to my appointments.

Indeed the electronic diary seemed to have thought of everything. The alarm can even be set to sound – perhaps with an appropriate message – at any preset time of day, whether that day is today or in any year up to the year 2014.

The RAM Filing System (RFS) claims in the manual to be "a fully functional storage facility designed to complement the existing range of filing systems, (cassette, disc or net)". Rather a grand claim, but could it be lived up to?

Certainly I was initially impressed by the reduced restrictions on the use of its files. The filenames can not only be up to about 200 characters in length, but there can also be any number of files in the catalogue – if there is enough room in memory to hold them all. The RFS requires the minimum of workspace for itself – just 256 bytes.

The standard commands used within the filing system are explained in the Acacia manual. As certain of them are fairly complex, I found becoming au fait with the system a little more tricky than with the diary.

The manual, I feel, presumes a certain amount of knowledge of the reader and the initiation is not quite taken step by step.

Once mastered, however, I was once again most impressed. The system's automatic inclusion of creation time and date with saved files is excellent.

The information is displayed even when using the command *CAT to outline an index of all files held within the filing system. A simple addition, but I certainly found it greatly increased the usefulness of the system.

By far the most impressive feature of the whole package, and one stemming from its non-volatile nature, is the auto-boot facility.

To cut a fairly long and complex story short, this enables you to press Break or switch the computer off without losing the effects of all the commands previously typed in.

This is done by the creation of a special text file which may be LOADed, RUN or EXECUTed at power-on or the pressing of the Break key. (Execution merely treats the file as if it had been typed in – yet another useful facility.)

The advantages and applications of this are quite clearly far-reaching. You may have a standard set of function key strings which you don't wish to lose each time the computer is switched off, or you may want a program to be automatically loaded each time it is switched on.

Altogether, I feel that this extensive package is an extremely useful investment.

Karen Torevell

QUICK

THE BBC Micro has some excellent graphic commands – MOVE, DRAW, PLOT, GCOL, etc – built into its Basic. But they are rather tedious to use for anything but the simplest of pictures.

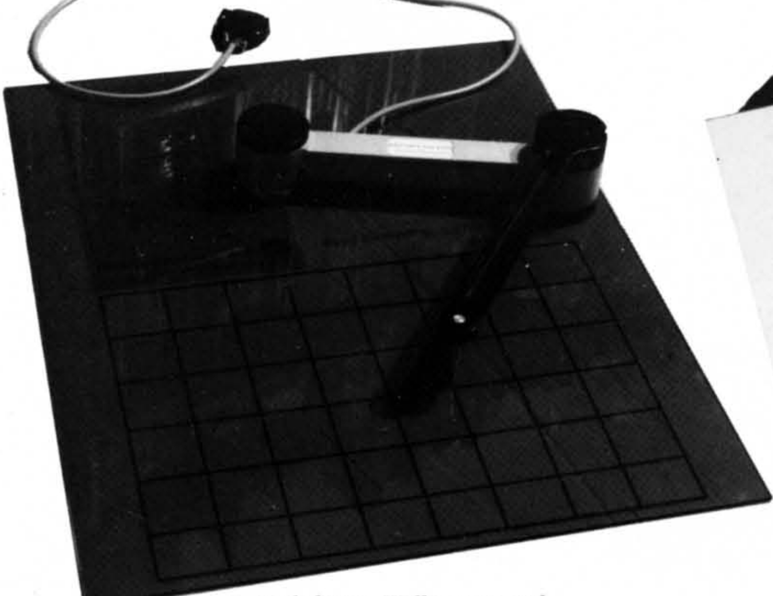
It is better to use (or write) a general purpose drawing program which employs the cursor keys to move about the screen and draw or indicate the location of previously defined objects.

Movement may also be made somewhat easier on a Model B by using the analogue port, ADVAL command and joysticks to replace the cursor keys.

The two systems reviewed here take us a step further in putting pictorial information into the computer. Both employ graphic tablets and a control program and allow the user to trace around actual pictures with a drawing arm.

These devices send X and Y coordinates of their position on the board, via the analogue port and appropriate programming, to the screen display (see Mike Cook's article on building a drawing arm in *The Micro User*, June 1983).

Both systems were tested on a 32k BBC Micro Model B with OS 1.2 and Basic II. So, how do the two compare with each other?



Beebplotter: Well constructed

Beebplotter *Watford Electronics*

THIS is supplied as a graphics tablet manufactured by Robot Developments of Hull, software on cassette and a manual.

The tablet is a sturdy transparent sheet of smoked Perspex measuring 48x40cm with a grid marked drawing area approximately 32x23cm.

It has an advantage over the Grafpad in that it can be placed over thick books to trace maps and diagrams and the source picture can be kept still without having to resort to sticking it down.

The tracing arm is the two piece potentiometer type and is well constructed in tough plastic.

The system plugs into the micro's analogue port via a 15 way D connector (provided) attached to a rather short (95cm) lead, which rather restricts the position of the tablet in use.

One thoughtful feature is the provision of a command summary on the tablet itself, as the list given on screen by the intro program is soon forgotten.

The software consists of two Basic programs – one giving instructions and setting up the grid, and the main program – two runplot routines, and five demonstration files.

Setting up time, including loading the programs and calibrating the grid, took me only two and a half minutes.

You are then asked to select a mode (0, 1, 2, 4 or 5) and whether a previously saved picture is to be loaded.

The facilities available are described in Table I and are selected by pressing the appropriate key. The space bar is used to indicate entry of a digitised point.

All this key pressing caused much distraction when tracing a drawing from the tablet.

In use, the LINE, RECTANGLE and CIRCLE options are very good as the potential position and shape of a figure can be visualised on screen before being fixed. In addition, a picture component can be removed in EDIT mode.

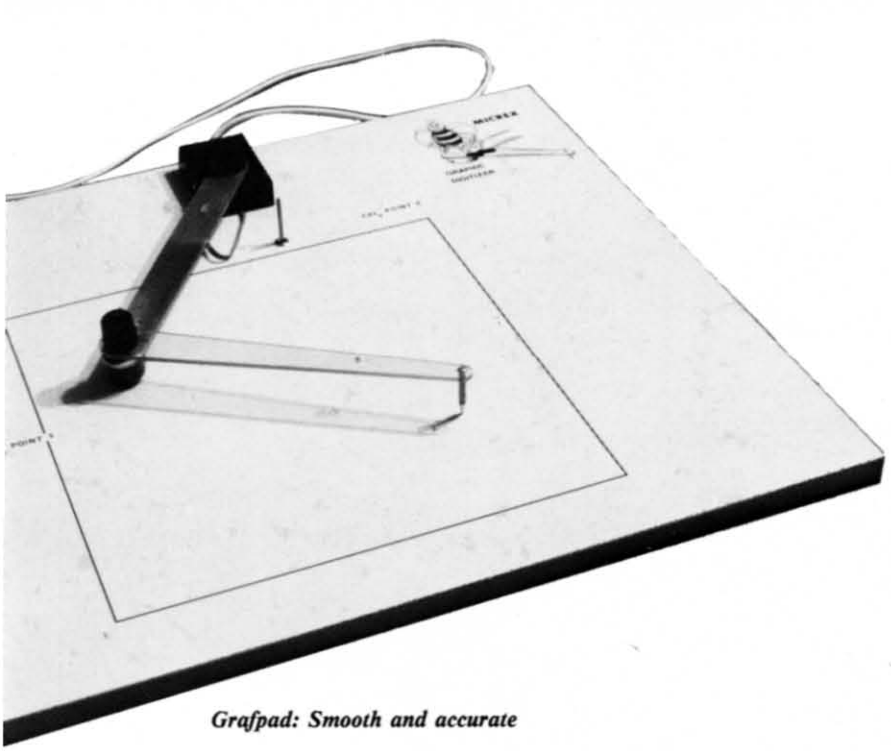
The MOVE/REDRAW feature is also useful as whole shapes can be duplicated in another position on the screen without having to redraw them manually (Figure IIIa). Text can also be added anywhere on the picture using the PRINT AT... option.

One of the most useful features is the FOLLOW option which allows the user to trace complex shapes. Rather disappointingly this is spoilt by stiffness of the drawing arm, making it difficult to draw smooth lines even after practice.

The cursor spot on the screen has a slight tendency to wander, requiring the space key to be hit at exactly the right time for precision.

Unfortunately the software is not completely idiot or bug proof on two of the options. Injudicious use of the infill command – for example if a shape is not completely closed or if used on top of an already filled area – caused me irreversible program crashes.

Also when altering colours – both



Grafpad: Smooth and accurate

ON THE DRAW

foreground and background may be altered – the command instruction itself changed colour and sometimes became invisible, making remedies difficult.

It is also a good idea to note the colours and mode of a drawing when saving, as the latter cannot be altered during a run. Surprisingly, crashing the program is also not uncommon when loading the demonstration files.

A printout option is provided in the command table, though the user is expected to incorporate a screen dump facility into the empty procedure in the main program.

This was fairly easy to do and worked well with both an Epson dot matrix and an Olivetti ink jet printer.

The plotter programs, and saving or loading of picture files, worked on either tape or disc systems without any modifications.

Grafpad — *Micrex*

THIS package also consists of a graphic tablet – in this case called a graphic digitiser – a software cassette and a manual.

The tablet is a solid laminated board measuring 51x46cm and is finished in BBC cream (see picture). The drawing area is slightly squarer and larger (29x28cm) than on the Beebplotter.

The drawing arm, which is also of the two piece potentiometer type constructed in metal and plastic, seems less sturdy than the Beebplotter, though it has a locking pin for when not being used.

It does, however, have the big advantage of being much easier and smoother to use, and, combined with the fact that the screen cursor doesn't wander, it seems much more accurate.

A Draw button is also provided on the board to indicate the start and end of a digitising action – an improvement on the Beebplotter's "press the space bar".

Unfortunately, the connecting lead, terminated by the analogue D plug, is even shorter (80cm) than on the Beebplotter, causing difficulties in board positioning.

The software provided is in Basic and includes a loader/instruction program, a main program, three data files and a redraw routine.

On running the loader program I experienced a feeling of *deja vu* as the standard Clare's Grafkey/Grafdisk/Grafstik instructions appeared.

The features available are shown in Table I and are operated by the function keys for which a tear-off crib sheet is provided to fit under the BBC's plastic strip.

Function key 9 acts as a shift key to obtain more options, but is a little too close to the Break key for comfort.

All the features of Beebplotter are present, except for MOVE and EDIT – a pity as these can prove particularly useful. There are, however, some additional routines in Grafpad – TRIANGLE, RUBBER-BANDING and superimpose GRID.

Perhaps the most significant of these is rubber-banding, in which the user can indicate up to four points (for example, the base of a pyramid) and then move the plotter around to "pull out" the apex and attached vertices (Figure Ib).

Selection of colours – 16, including flashing, are available – is easier than Beebplotter as a palette is displayed on screen and the required colour digitised. However, unlike Beebplotter, only foreground colours are available.

One advantage of Grafpad is that the mode (0, 1, 2, 4 or 5) can be changed without losing the current picture.

Perhaps the biggest joy (and disappointment) is the PAINT mode, operated like the FOLLOW mode of

From Page 143

Beebplotter. This allows fairly accurate tracing of diagrams placed on the tablet or can be used for doodling.

It is also possible to vary the thickness of the brush and therefore use it to shade in areas making intricate and pretty pictures.

The disappointing part is that following all that effort, the painted portions of the pictures cannot be redrawn following a screen clear, nor can they be saved on tape.

The complete screen SAVE option is only available on the disc version of the program otherwise saving and loading files is straightforward and works well, though there is no facility to provide separate filenames for pictures.

All were called DATA. Thus searching for a particular picture was tedious.

No printout or screen-dump facility is provided – a big minus for any computer aided design work – and it is difficult to add one's own print routine owing to Clare's extensive software protection.

Similarly, I found it difficult to modify the tape version to work on disc systems. But a separate redraw routine is provided to enable users to incorporate pictures drawn with the Grafpad into their own programs.

Beebplotter		***Grafpad***	
Facility	**Key**	**Facility**	**Key**
Line	L	Line	f0
–	–	Triangle	f1
Rectangle	R	Rectangle	f2
Print at . . .	P	Write text	f3
Circle	C	Circle	f4
–	–	Rubber banding	f5
Define colours	D	–	–
Alter colour	A	Colours	f6
Infill	I	Fill	f7
Follow	F	Paint	f8
–	–	Brush width	,
Move and redraw	M	–	–
Edit	E	–	–
–	–	Grid	f9 f0
Wipe screen	W	Clear graphics	f9 f1
–	–	Redraw	f9 f2
Save picture	S	Save picture	f9 f3
Load picture	ESC	Load picture	f9 f4
Memory left	@	Free memory	f9 f5
Clear data	ESC	Purge	f9 f6
Select mode	01245	Change mode	f9 f7
Printout	X	–	–

Table I: Facilities and commands available on each system

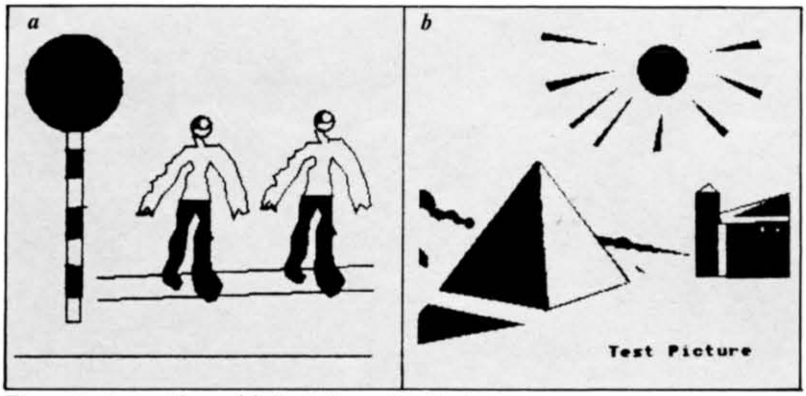


Figure I: Output from (a) Beebplotter (b) Grafpad

CONCLUSION

OVERALL, both systems performed reasonably well, though in a limited fashion. Both are well constructed and though Beebplotter was easier to set up and use, perseverance with the Grafpad paid its rewards eventually with more versatile pictures.

In both systems, transfer from graphics tablet to keyboard for the commands was a nuisance and could probably have been replaced by a digitisable menu on the tablet.

Disadvantages of the Beebplotter, such as a stiff drawing arm and occasional program crashes, may be balanced against the advantages of a transparent baseboard and its MOVE and EDIT facilities.

On the whole, Grafpad's tablet performed well, as did the software with its extra features.

Its biggest drawback was the inability to save traced (PAINT mode) drawings, one of the main reasons for using a graphic tablet in the first place, and the lack of a printout option.

Both systems should be satisfactory in an educational environment, especially for reproducing simple geometric shapes and for drawing pictures to add to one's own programs.

Their tracing facilities are somewhat limited and therefore they offer only small advantages over other cursor or joystick drawing programs . . . and at a price!

They do, however, introduce the user to some of the excellent graphic capabilities and high resolution plots of the BBC Micro. But for more professional computer aided design or technical work requiring the measurement of traced areas, a non-potentiometer type digitiser will probably be needed.

Mike Mahon

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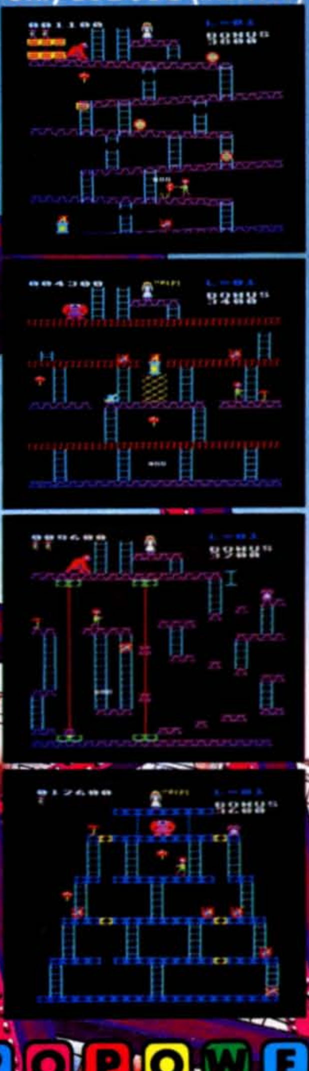

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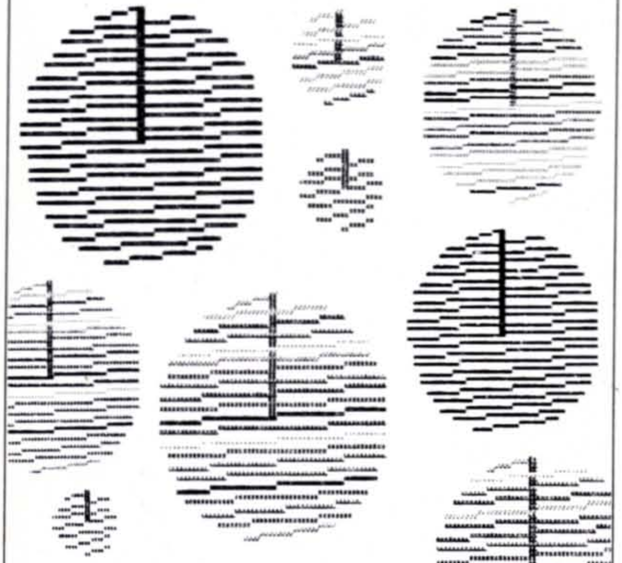

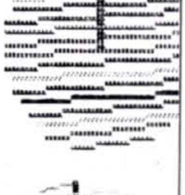

LANTERN is a short but powerful graphics demonstration from K. Goodacre of Sheffield.

The first part of the program fills the screen with small lanterns of all descriptions. Then the screen is cleared and the BBC Micro draws one large lantern.

Although not a very long listing, there's a lot going on in it. You can see the results for yourself!

```
 10 REM LANTERN
 20 REM BY K.GOODACRE
 30 REM (C)
 40 MODE 2
 50 VDU 23,1;0;0;0;0
 60 C%=1
 70 T%=0
 80 REPEAT
 90 Z%=RND(2)
100 T%=T%+1
110 GCOL 0,RND(7)
120 X%=RND(1279)
    :Y%=RND(1023)
    :R%=RND(90)+30
130 MOVE X%,Y%
140 FOR I%=Y%+R% TO Y%-R%
    STEP -10
150 IF Z%+C%>2
    THEN GCOL 0,RND(7)
160 J%=SQR (ABS (R%*R%-(I%-
    Y%)*(I%-Y%)))
170 DRAW X%-J%,I%
180 MOVE X%+J%,I%
190 NEXT I%
200 IF T%>41
    THEN GOTO 270
210 UNTIL T%>40
220 CLG
230 X%=640
    :Y%=510
    :R%=500
240 Z%=2
250 T%=T%+1
260 GOTO 130
270 FOR T=1 TO 2000
    :NEXT
```

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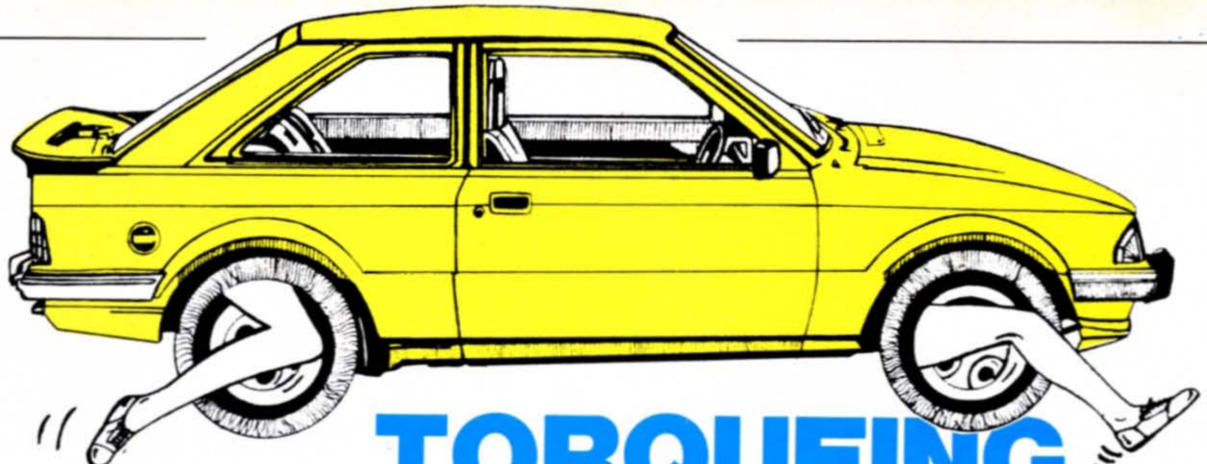

TORQUEING OF STEPPING MOTORS

By MIKE COOK

THIS seems to be the Year of the Robot. What with the BBC TV series "Computers in Control" and the upsurge of computer add-ons of various forms, all designed to produce movement in response to computer control.

There is a plethora of buggies that scurry about the floor, robot arms that make a sudden grab for you or plotters that will draw out high resolution pictures in as many colours as you have felt tip pens.

In all this work the single most popular method of producing movement is by means of a stepping motor. Although this is not the only way of generating movement on demand, it does have many advantages.

You probably already own a couple. There is one in your disc drive and two in most printers.

These motors have been around for many years but only recently have there been low cost computers to take full advantage of their special features.

So this month we have a look at stepping motors and how to drive them.

A normal motor starts to rotate when you apply a voltage to it and slows down and stops when that voltage is removed. If you want to control its speed you usually have to resort to gears.

Although there are various electronic methods of motor speed control these are usually used to make small adjustments, while it is gears that get the speed in the right order of magnitude.

The problem is that for a conventional motor to run efficiently it has to run at around 300 rpm.

The amount of turning power, or torque as it is known, is the way a motor's power is measured. With gears, as the speed is reduced the torque is increased – a very happy state of affairs.

However most electronic motor control reduces the speed as well as the torque.

When it comes to controlling a conventional motor with a computer the motor takes some time to get up to its final speed. So it is difficult for the computer to "know" how many revolutions it has turned through.

It is normal therefore to include some form of feedback arrangement so the computer can sense the motor's position.

However this feedback is not needed with stepping motors, which is why they are such a natural for use with computers.

A stepping motor, as its name implies, works not by continuously rotating but by moving in a series of small steps. Each time the motor receives a pulse it moves through a fixed angle. The size of this angle depends mainly on the design of the motor.

Motors are usually classified by how many steps are taken to complete one

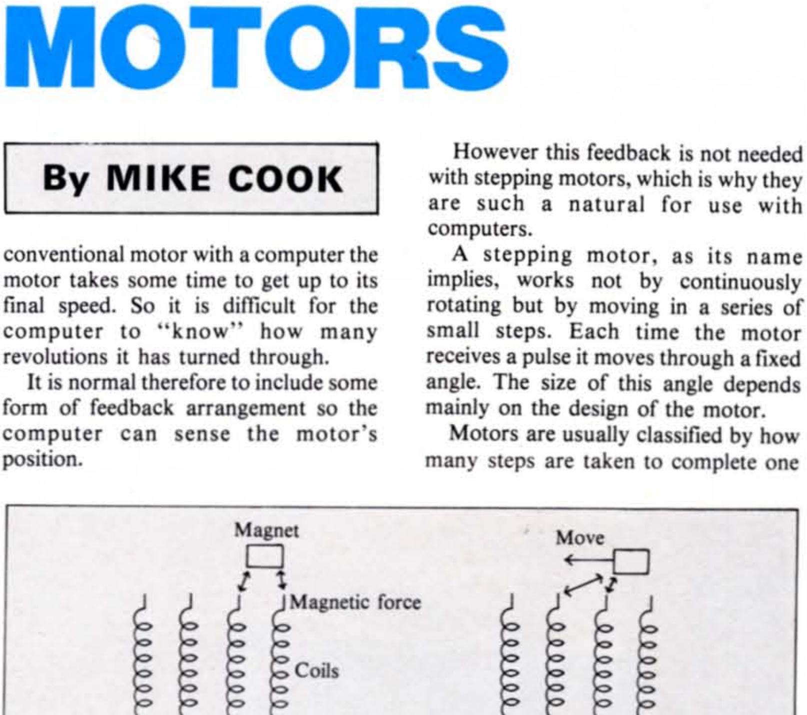

Figure 1: The principle of a stepping motor

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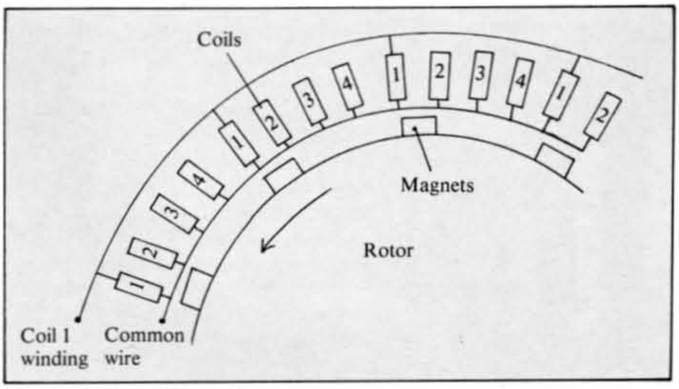

Figure II: A stepping motor

revolution – ranging from 4 to 200 steps per revolution.

Another way of expressing this is to quote the size of angle of each step.

As stepping motors are difficult to get hold of *The Micro User* is offering Stepping Motor Experimenting Kits as Body Build Packs Nos. 12 and 13 (see Page 157 for the order form). These include a motor as well as the electronics to drive it.

The stepping motor we have used has a step angle of 7.5 degrees. It is the same type as is used in some of the commercial devices advertised in these pages.

Let's see what makes a stepping motor tick. If you have a coil and pass a current through it you will generate a magnetic field. This will behave just like any other magnet and will attract other magnetic material to it.

Suppose we have a permanent magnet suspended above four coils. If we pass current through two of the coils the magnet will be attracted towards both and will settle somewhere between the two. This is shown in Figure Ia.

We have an arrangement, which will be explained later, to prevent the magnet getting too close to the coils.

Now supposing we remove the current from coil 1 and turn on coil 3, as in Figure Ib.

The magnet will move towards the two coils that are exerting a magnetic force and will come to rest between coils 2 and 3, as in Figure Ic.

We can repeat the process with coil 2 going off and coil 4 coming on, as shown in Figures Id and Ie.

If we look what has happened to our magnet we will see that it has moved in a straight line in response to our switching currents in the coils.

This is the principle of the stepping motor, only instead of movement in a straight line we have a circular movement.

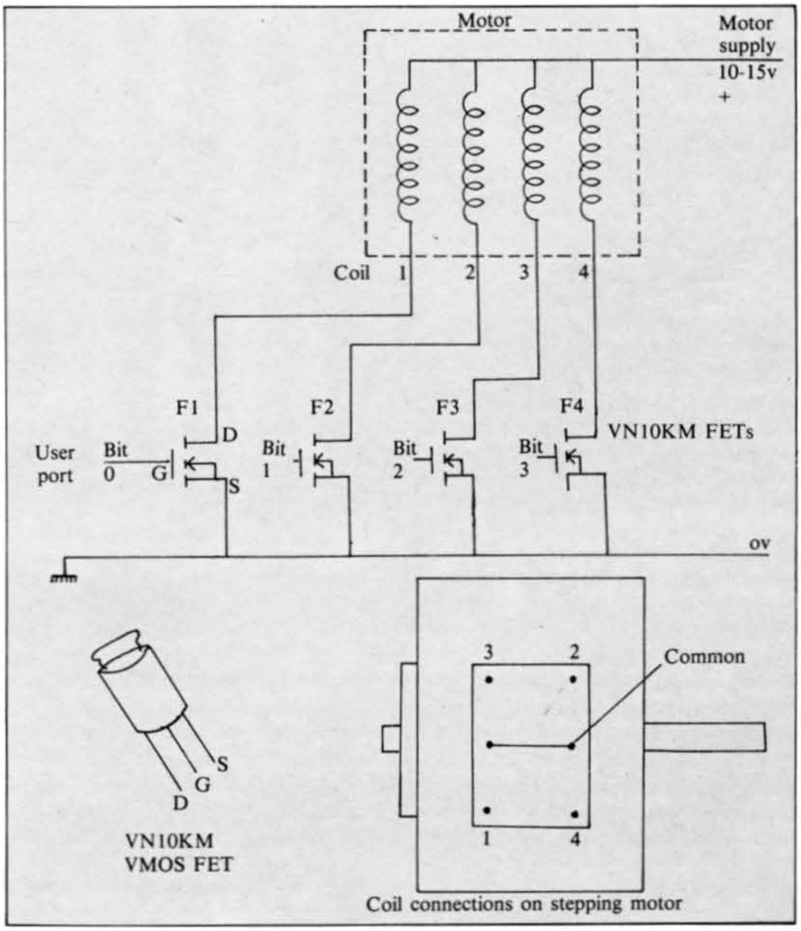

Figure III: Control of a stepping motor

This is obtained by having several coils, each wired as one of four circuits, distributed in a circle. We call this the stator of a motor because it does not move.

In the centre of the circle we have a drum bearing a number of small magnets. The drum is known as the rotor – it's the part that rotates.

The magnets are not actually separate magnets but are bumps or poles on a large central magnet.

As the rotor is on bearings and the poles are distributed evenly around it, the poles can never come in contact with the coils.

Figure II shows a small section of a stepping motor. Only coil 1 is shown

→

From Page 149

wired up, for clarity, but you can see that every fourth coil is connected together.

You can also see that the number of coils in the stator is four times the number of poles on the rotor, and this number determines the angle of each step.

A stepping motor can therefore be precisely controlled by switching the currents in each of its four coils. So a stepping motor has five wires coming out of it, one for each coil and one common connection.

The coils take far more current than can be produced by the computer. This means we have to build something to convert our logic voltage output to the currents needed.

The simplest way to do this is to use four VMOS power FETs. These devices were explained in the Body Build article in the August 1983 issue of *The Micro User*.

Figure III shows the general arrangement. You can see from this that the stepping motor usually requires more than the normal 5 volts, and this is applied to the motor through the common coil connector.

Most motors will operate with between 12 and 24 volts, although some can use 120 or even 240 volts. The FETs shown will happily switch voltages of up to 60 volts.

Each of the FETs is controlled by one bit on the user port and should be connected up using Body Build packs 1 and 2 or something similar. Therefore by putting a logic 1 on the user port output we can switch the coil on.

By outputting the correct sequence of logic levels we can make the motor rotate.

If we refer back to Figure I and write a logic 1 for each coil that is on and a logic zero for each coil that is off, we get the sequence of numbers to present to our motor. This will be 3, 6, 12, 9.

Note the last one is not shown in Figure I, but it is needed to wrap round smoothly to the start of the sequence again.

Before we see how this can be generated by the computer let's look at another possible sequence of pulses that we can use to drive our motor.

Consider Figure IVa. This shows the motor in the same position as Figure Ia. Now if we leave only one coil on, the magnet (pole) will go directly over it. This is shown in Figure IVb.

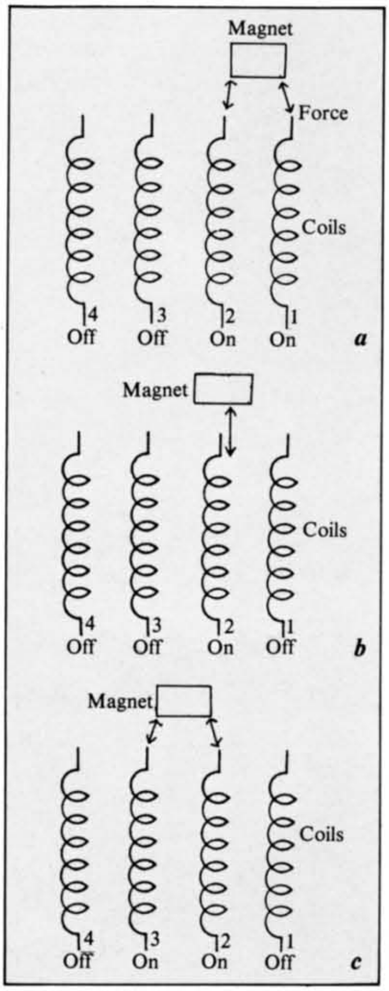

Figure IV: Half stepping a motor

If we now switch on coil 3, the magnet will move between the two (see Figure IVc).

If we extend this sequence we will find that it takes twice as many steps as the first sequence. This results in the motor moving through only half the angle for each step – known as half stepping the motor.

The degree of precision is greater, but as you might expect there is a price to pay – the motor's torque is reduced. As there is one coil on for half the time, you are putting less power into the motor. Therefore you get less power out.

With the full step sequence there are two coils on all the time. However in some circumstances it is a useful trick to know.

Any software must present the correct sequence to the motor. The easiest way to do this is to hold the sequence in an array and set up a counter to keep track of the next element in the array to be outputted.

A program to do this is shown in Listing I on Page 152.

The procedure to output the next bit pattern in the sequence is from line 280 to 350.

It is passed two variables. The first, "ROUND", is a logic variable to tell the procedure which way to step through the sequence.

The second variable is used in a delay loop to control the speed of the motor. The delay loop is executed first and then D% is set depending on the direction you want to go.

Line 310 moves N% on to the next sequence in the pattern. The logical AND instruction ensures that if N% is 7 and we add one we will get 0. Also if N% is 0 and we subtract one we will get 7.

This effect is known as the number "wrapping around". The AND instruction was explained in the August 1983 issue of *The Micro User*.

In order to show off the stepping motor procedure the rest of the program makes the motor rotate backwards and forwards.

When I show this to my students I have a small Union Jack on a cocktail stick which I attach to the motor. The computer enthusiastically waves the flag, which is a good thing for a British computer.

As you can see, the motor does not run very fast. But by simplifying the program it is possible to get it working at top speed. However top speed is something that is very variable.

We have seen that torque is the pulling power of a motor. In a stepping motor the torque is inversely proportional to speed. That means the slower it goes the more power it has.

In fact it has maximum torque when it is stopped. You can test this by trying to force the motor to turn by hand.

You will find this harder to do when it is stopped – but still has two coils on – than when it is running fast. If we try to make it go too fast the motor will not have enough torque to turn itself, let alone a load, and so will stall.

When you approach stalling speed you will notice the motor start to miss steps and make a stuttering sound. This maximum speed of the motor from a standing start is called the "pull-in" speed.

If the motor is running it can be accelerated to a speed slightly faster than the pull-in speed. So if you want to run stepping motors at full tilt you have to start them relatively slowly.

One way to achieve more torque, and thus a greater speed, is to increase the current through the coils. This means increasing the voltage used to drive it.

At some point you will reach a limit imposed by the DC current rating of the coil. In fact you can go even faster than this by employing a little trick.

When you switch a coil on initially there is no current flow as the change in current in the windings induces a magnetic field. This field then induces a voltage back in the coil, but in a direction to oppose the current flow.

If this process was 100 per cent efficient you could never get any current to flow in a coil, but fortunately it is not. The result is that when the coil is switched on it takes a time for the current to build up.

If you are stepping the motor fast, the current will not have built up to its full amount before the coil is switched off again.

This accounts for the strange fact that a stepping motor takes more current when it is stopped than when it is moving.

The trick in getting a faster rise time of current is to increase the voltage even more. However this will exceed the maximum DC current through the winding and so a resistor should be inserted in each coil line to limit the current.

When calculating the value of the resistor make sure to allow enough wattage as the resistor will get warm.

The inductive part of the resistor/coil combination is thus proportionally smaller and so there will be a faster rise time of current in the coil, allowing a faster speed to be achieved.

The only snag with the type of control I have described so far is that it requires four computer output bits to drive the motor.

We can make a saving in this number if we generate the sequence, not with software, but with hardware. Then we need only two bits to control our motor – one to specify direction and one to tell it to step.

We can control seven motors from the user port as long as we only want to move the motors in one direction at a time.

Alternatively, if we want full simultaneous control of each motor we can drive four from the user port.

You can generate the required sequence with two JK flip-flops and a data select IC. This can be fed to the same power FET drives as shown previously.

However there is an IC which will do the whole job for you – and it is cheaper than individual components. The circuit diagram is shown in Figure V.

The Mullard SAA1027 works with high level logic and therefore the logic levels out of the computer have to be boosted by the transistors T1 and T2. This IC can be connected directly to the stepping motor's coils with any supply between 9.5 and 18 volts.

To drive this all you have to do is to set the logic level for the required direction and give a pulse to the step line.

This is shown in Listing II and essentially does the same as Listing I but is designed for the new hardware circuit. Also any one of seven motors can be specified.

The direction line on all the stepping motor circuits should be wired up to bit 0. The step line should be wired to any output bit 1 to 7.

The program asks you which motor you want to use and line 130 converts this to a number with the appropriate bit on the user port set to a logic one.

You can see the procedure for stepping the motor is a lot simpler. After the delay, line 280 outputs the direction indicator D% and sets the step line high.

The next line keeps the direction indicator the same and puts the step line low again.

If you want to control more than one motor you can have a step and direction

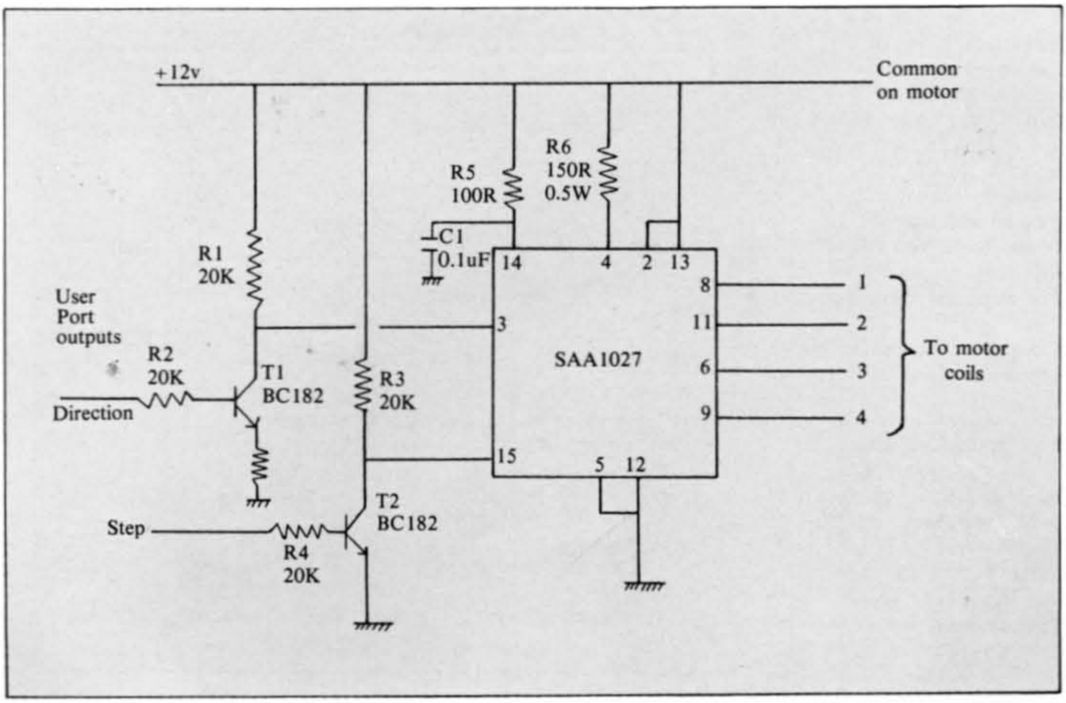

Figure V: A hardware sequence generator circuit

THE BEEB BODY BUILDING COURSE

From Page 151

line for each motor. In this way the motors are entirely independent.

The program needed to drive four motors independently and simultaneously is a little involved and best left for another time.

However if you want a crack at it you could use the event timer to initiate a background task. This would decrement a counter for each motor and output a pulse to those motors whose counters had reached zero.

In this way a Basic program could just store numbers into those counters to get the motors moving.

Two Body Build kits are available this month, one using the computer to output the sequence and the other using the SAA1027 stepping motor driver chip.

I could have laid out a small printed circuit for each kit, but as you will probably be incorporating the motors into your own devices it would not have been worthwhile. So the kits contain components only this month. The full contents can be found in the component lists below.

Finally, you will need a power supply to drive the motors. If you are just running one or two you can use the external power socket on the underside of the computer. You can get the sockets from advertisers in this magazine.

If you are planning to use more, or you already have your discs plugged in, you will have to buy or make a supply. The type of supply made for CB radio transmitters is usually reasonably priced and should do an adequate job.

Having now got the tools, you can devise your own projects in the fascinating world of computer control and robotics.

Remember the slogan: "If it moves it's probably a stepping motor". No? Well, see you next month.

Component list Body Build Pack 12: **ID 35 35014 stepping motor, 4 VN10KM VMOS power FETs.**

Component list Body Build Pack 13: **ID 35 35014 stepping motor, SAA1027 stepping motor drive IC, 2 BC182 transistors, 4 20K resistors, 100R resistor, 150R 0.5W resistor, 0.1 uF disc ceramic capacitor, 16 pin IC socket.**

```
 10 PRINT "The Beeb Bodybuilding
    Course"
 20 PRINT "May 1984"
 30 PRINT "STEPPING MOTOR Direct
    Control"
 40 PRINT "By Mike Cook"
 50 REM MAKE USER PORT OUTPUTS
 60 ?&FE62=&FF
 70 DIM P%(7)
 80 N%=0
 90 CLOCKWISE=TRUE
100 YOU_PRESS_BREAK=FALSE
110 INPUT "Full (F) or Half (H)
    steps ",A$
120 IF A$="H"
   THEN RESTORE 370
   ELSE RESTORE 390
130 REM INITIALISE OUTPUT PATTERN
140 FOR A%=0 TO 7
150 READ P%(A%)
160 NEXT
170 INPUT "Pick a speed factor (1-30
   00)",S%
180 INPUT "How many steps in the
    wave",W%
190 PRINT "Press break when you
    are fed up"
200 REPEAT
210 FOR A%=0 TO W%
220 PROC_STEP(CLOCKWISE,S%)
230 NEXT
240 CLOCKWISE=NOT (CLOCKWISE)
250 UNTIL YOU_PRESS_BREAK
260 END
280 DEF PROC_STEP(ROUND,DELAY%)
290 LOCAL D%,A%
300 IF ROUND
    THEN D%=1
    ELSE D%=-1
310 N%=(N%+D%) AND 7
320 FOR A%=1 TO DELAY%
330 NEXT
340 ?&FE60=P%(N%)
350 ENDPROC
360 REM HALF STEP DATA
370 DATA 1,3,2,6,4,12,8,9
380 REM FULL STEP DATA
390 DATA 3,6,12,9,3,6,12,9
```

Listing I

```
 10 PRINT "The Beeb Bodybuilding
    Course"
 20 PRINT "May 1984"
 30 PRINT "STEPPING MOTOR Direction
    and Step"
 40 PRINT "By Mike Cook"
 50 REM MAKE USER PORT OUTPUTS
 60 ?&FE62=&FF
 70 ?&FE60=0
 80 CLOCKWISE=TRUE
 90 YOU_PRESS_BREAK=FALSE
100 INPUT "Pick a speed factor (1-30
   00)",S%
110 INPUT "How many steps in the
    wave",W%
120 INPUT "MOTOR TO WAVE (1 TO 7)
    ",M%
130 M%=2 ^ M%
140 PRINT "Press break when you
    are fed up"
150 REPEAT
160 FOR A%=0 TO W%
170 PROC_STEP(CLOCKWISE,S%,M%)
180 NEXT
190 CLOCKWISE=NOT (CLOCKWISE)
200 UNTIL YOU_PRESS_BREAK
210 END
220 DEF PROC_STEP(ROUND,DELAY%
    ,M%)
230 LOCAL D%,A%
240 IF ROUND
    THEN D%=1
    ELSE D%=0
250 FOR A%=1 TO DELAY%
260 NEXT
270 REM OUTPUT A STEP
280 ?&FE60=D% OR M%
290 ?&FE60=D%
300 ENDPROC
```

Listing II

Free software, only £225.

If you own a BBC Micro, you can now download, store and run programs (transmitted free of charge via Ceefax) with the new Teletext Adaptor, priced £225 inc. VAT.

These programs make up the BBC Telesoftware Service (which is intended to become a computer software broadcasting channel) and although primarily educational, they will soon develop into general interest and business areas.

And, as they will change every two weeks, you'll soon be able to build up a vast bank of top quality software without ever having to put your hand in your pocket.

But that's not all the adaptor has to offer. It also enables you to gain access to the normal teletext store of data. This is different to simply having a teletext TV because it means this data can now be transferred to memory and manipulated in any way you wish (making graphs or bar charts for instance).

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(You can also find out the address of your local BBC Micro dealer by calling the same numbers.)

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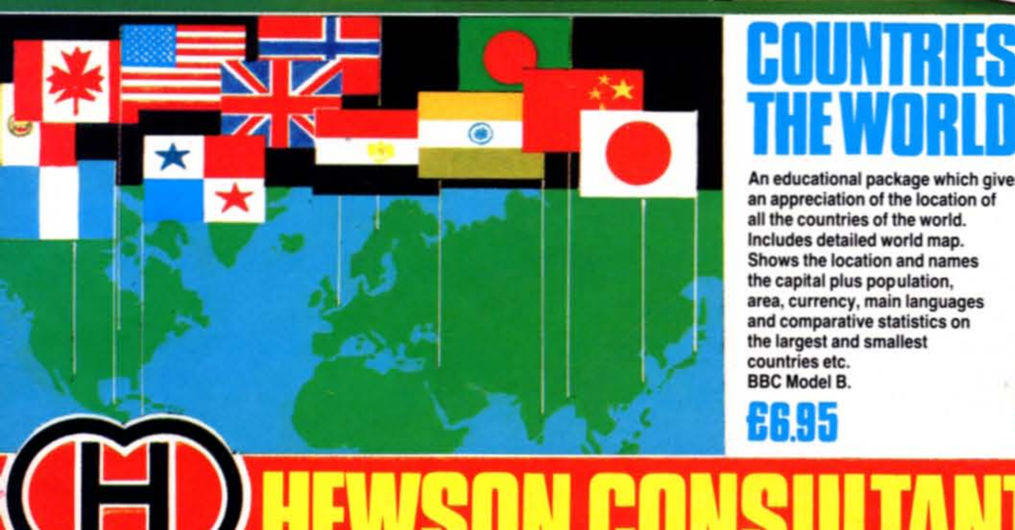

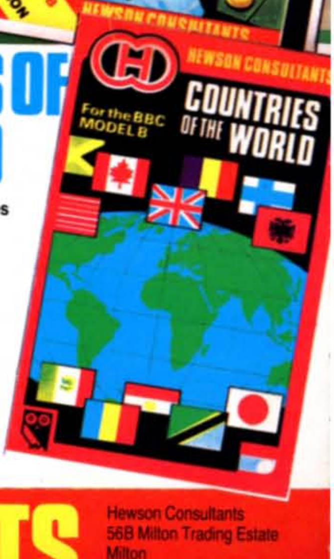

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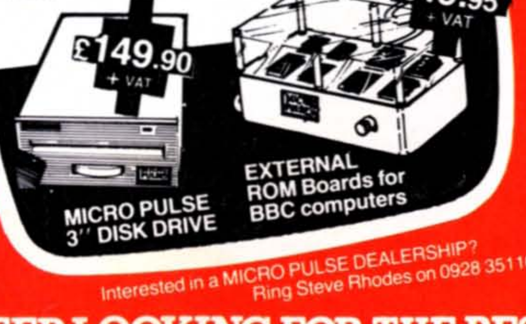

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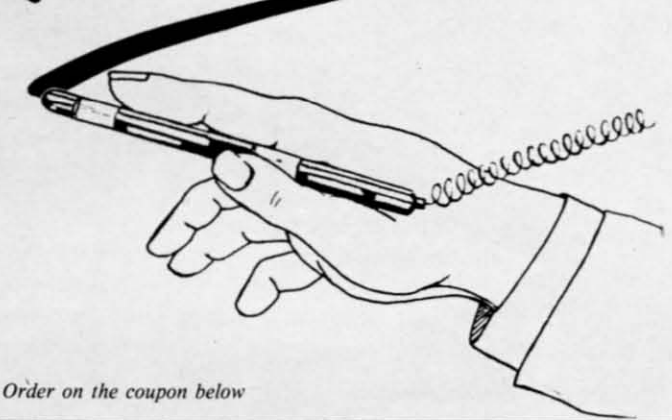

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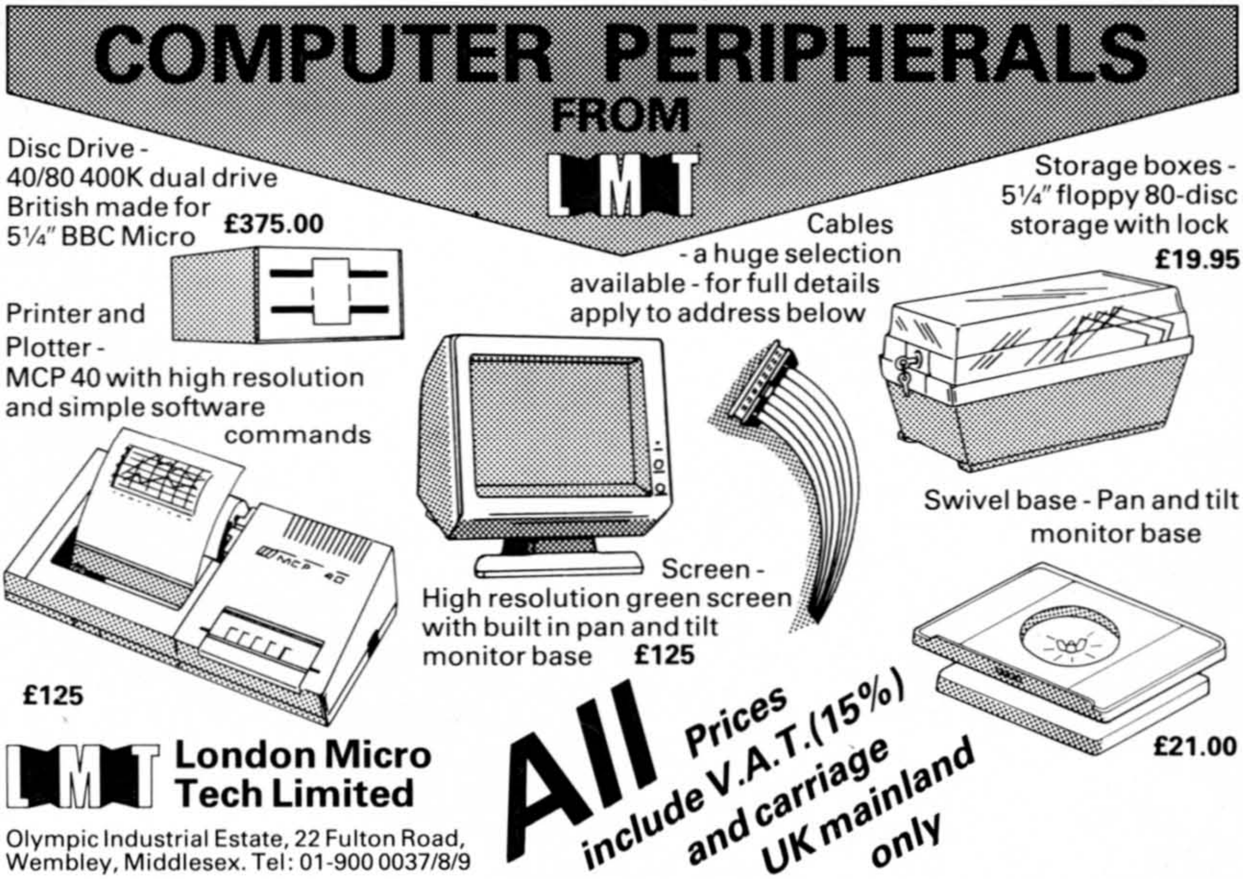

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March Issue

DEATHWATCH, a superb arcade game **BINGO**, clever uses of the randomise function; **BUBBLESORT** routines; **TESTS** function keys in machine code. 0.1 **COLOUR** and **GRAPHICS ROUTINES**: create a kaleidoscope of screen designs.

BBC
MICRO
USER
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and 22 other programs listed in the pages of BBC Micro User Vol. 1, No. 2.

April Issue

KING KONG, rescue girls from the Empire State Building before killing Kong. **NIM**, a structural game of strategy. **TOKENS**, unravel the Basic ROM: **FORMATTER**, an essential disc utility; **DISASSEM**, a full machine code disassembler.

BBC
MICRO
USER
AIR STRIKE!
32k
and 33 other programs listed in the pages of BBC Micro User Vol. 1, No. 3

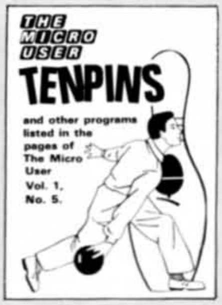
May Issue

AIR STRIKE, a fast and furious arcade game: Test your mental powers with **PELMANISM; ANAGRAMS**, the word game. **CHARACTER**, generate vertical and inverted text. **TELETEXT**, animation in Mode 7. **BEEB**, two joystick exercises.

THE
MICRO
USER
SPACE PILOT
and other programs listed in the pages of BBC Micro User Vol. 1, No. 4.

June Issue

SPACE PILOT, lost in space you must fight off repeated attacks from alien life forms. **NOMISM**, you are a nomadic herdsman desperately trying to eke out a living on the plains of Africa. **COLOURFUL CHARACTERS PLUS** other listings from the June issue.


THE
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TENPINS
and other programs listed in the pages of The Micro User Vol. 1, No. 5.

July Issue

TENPIN, a simulation of Tenpin Bowling; **SPACEPODS**, beat the alien hordes; **CUP**, Exciting 3D graphics techniques **TEST** and **STEADY**, programs to accompany the Beeb Body Building Course. **BREAKFIX**, Don't let Break destroy your precious variables!

THE
MICRO
USER
FRUITIES
and other programs listed in the pages of The Micro User Vol. 1, No. 6

August Issue

FRUITIES, driven by strange urges you climb the ladders of adventure to risk all in the gardens of unearthly frights. **ANIMATION**, a suite of programs that really bring your screen alive; **CASDISC**, the machine code downloader for your disc system; **MODE 7** colour routines.

THE
MICRO
USER
Robin and Marian
and other programs listed in the pages of The Micro User Vol. 1, No. 7

September Issue

ROBIN & MARIAN, rescue Maid Marian from the Sheriff of Nottingham. **GALACTIC INVADERS**, an exciting arcade game. **DFS BENCHMARKS**, 14 DFS test programs. **ANIMATION**, new techniques. **TERMINAL**, connect a BBC Micro to a mainframe.

THE
MICRO
USER
GONE FISHIN'
and other programs listed in the pages of The Micro User Vol. 1, No. 8

October Issue

FISHING, a compulsive day's angling. **JOYKEY**, convert programs to joystick. **PENTEST** and **BELLRINGER**, for Micro User light pens. **CONTOURS**, an educational program. **LINK** BBC Micros to each other. **PLUS** all the listings from the first Electron User.

THE
MICRO
USER
Goblins and Blackjack
and other programs listed in the pages of The Micro User Vol. 1, No. 9

November Issue

GOBLINS, an enchanted journey. **BLACKJACK**, the casino favourite. **CHARGE** and **PENDULUM**, Body Building Course part 9. **SIDEWAYS**: programs in ROMs. **PENDRAW**, a light pen sketching program. **PLUS** all the programs from the second Electron User.

THE
MICRO
USER
Tower Bridge
and other programs listed in the pages of the Micro User Vol. 1, No. 10

December Issue

TOWER, rescue London's treasure **SANTA**, help Father Christmas deliver his presents. **VDU 23**, an invaluable character defining utility. **PAGED**, the listing from our paged graphics article. **PLUS** all the listings from the third issue of Electron User.

THE
MICRO
USER
Barrel Battle
and other programs listed in the pages of the Micro User Vol. 1, No. 11

January Issue

BARRELS, an all-action arcade game. **NOTEPLAY**, an entertaining musical utility. **DUMP1** and **DUMP2**, multitone screen dumps. All the programs from our **SOUND, BEGINNERS'** and **GRAPHICS** articles **PLUS** 12 programs from the fourth Electron User.

THE
MICRO
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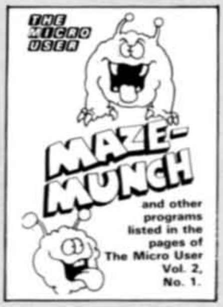
ALIEN INVASION
and other programs listed in the pages of the Micro User Vol. 1, No. 12

February Issue

INVASION, the classic arcade game. **FROGS**, fun for all the family. **ENGVGEN**, a logic game. **BALANCE**, a number learning program. **KEY**, single key entry for the BBC Micro **PLUS** nine other programs from The Micro User.


THE
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MAZE-MUNCH
and other programs listed in the pages of The Micro User Vol. 2, No. 1.

March Issue

MAZEMUNCH, blockbusting arcade action. **BIRTHDAY**, family fun for our anniversary. **DERRICK**, number fun for infants. **PIXELPEN**, high resolution for lightpens. **LOADTAPE**, a recovery utility. **PLUS** 18 other programs from the pages of Micro User.

THE
MICRO
USER
Micro golf
and other programs listed in the pages of The Micro User Vol. 2, No. 2.

April Issue

MICROGOLF, the simulation. **EASTERMAZE** and **APRIL FOOL**, seasonal games. **SEAWALL** and **MAGIC SQUARE**, maths fun. **FILER** and **ALBUM**, a database of sounds. **TRX1, TRX2**, RS243 driver. **HEARTRATE**, monitor your fitness.

THE
MICRO
USER
DAMRAIDERS
and other programs listed in the pages of BBC Micro User Vol. 2, No. 3

May Issue

DUG DIG, asteroid adventures. **DAMRAIDER**, naval action. **ENVAID**, easy envelopes. **STEPPERS**, Body Building motor control. **SPIRO**, graphics windows. **ADVENTURE**, a trapdoor maze. **RENUMBER**, program utility. **BIGLETTER**, large type. **MEMORY**, RAM efficiency.

Micro User programs now on disc as well as on cassette!

Since we started our highly successful cassette service to readers we have been inundated with requests to supply each month's programs on disc.

Now it's happened! We've even incorporated an automatic menu downloader. Just boot up the disc, make your choice from the menu, and away you go! And all for £5.75 a disc, including post and packing. Of course, our very popular cassette tapes of the month's programs are still available. The price for these is unchanged – £3.75 a cassette, including post and packing.

ORDER FORM ON PAGE 197

Addressing the envelope

ANYONE who has tried to learn how to use the ENVELOPE command, either by using the manual or by copying from a program, will know how confusing it can be.

This program sets out to remedy this by supplying a ready made envelope — a wailing siren — and allowing the user to change any term to see what difference it makes.

The envelope and the sound statement can also be set to zero and new values put in.

The instructions and notes can be read at any time without upsetting program values.

No attempt has been made to handle simultaneous notes or the special non-repeating use of T.

Use envelopes from other programs and back issues of The Micro User or Electron User to see how they work, and keep a note of good ones for future use.

Try this dual role program — an invaluable utility plus a useful teaching aid

```
 10 REM Addressing an Envelope.
 20 REM by J.Scott.
 30 REM Shebbear College.1984.
 40 ON ERROR PROCerr
 50 MODE 4
 60 PROCinit
 70 PROCprelim
 80 PROCtitle
 90 PROCinstr
100 PROCpitch
110 PROCamplitude
120 PROCsound
130 PROCsheet
140 PROCplaysound
150 PROCchoice
160 END
170 DEF PROCinit
    :READ C,A,P,D,N,T,PI1,PI2,PI3
    ,PN1,PN2,PN3,AA,AD,AS,AR,ALA
    ,ALD
    :ENDPROC
180 DEF PROCprelim
    :PROCtitle
    :PRINT '"  ""Envelope"" is a
     very complex"'"  function."'
    "  An envelope and a sound have
     been"'"  programmed into the
     computer."''"  If you wish
     to ignore the"'"  instructions
     and go directly to the"
190 PRINT "  programme to ""play"
    " with it first,"'"  press <SPAC
    E>."''"  To get the instructions
     press any"'"  other key."
    :G$=GET$
200 IF G$=" " GOTO 130
    ELSE ENDPROC
210 DEF PROCtitle
    :CLS
    :PRINT TAB(15,1);"ENVELOPE";
    TAB(15,2);"________"
    :ENDPROC
220 DEF PROCinstr
    :PRINT '"  The envelope is in
     three parts:"
230 PRINT ''"1.THE ENVELOPE NUMBER
     N."''"  This is to tell which
     envelope is to "'"  be used
     with a given sound.It has"'
    "  been set to 1 to begin with,b
```

Full listing starts on Page 163

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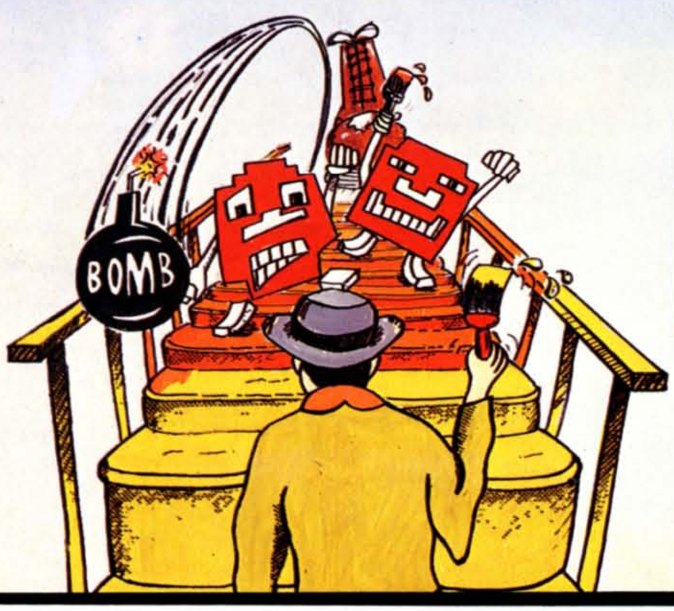

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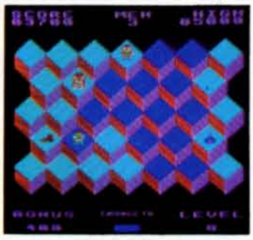

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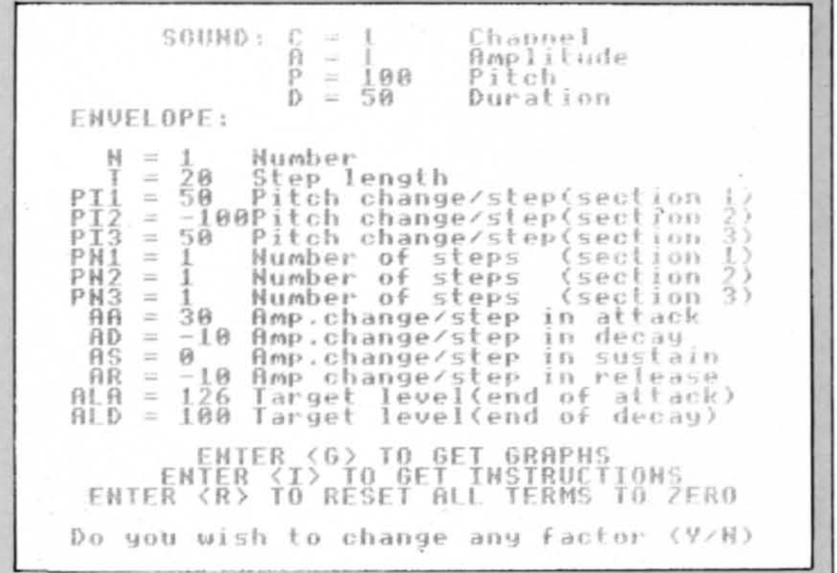
Envelope listing

From Page 161

```
    ut it"'"  can be changed later."
    :PROCpress
    :ENDPROC
240 DEF PROCpitch
    :PRINT ''"2.THE PITCH CHANGE
     TERMS."''"  The pitch may be
     changed in up to"'"  three
     sections"''"  Each section
     has PN steps,each of"'"  length
     T.eq.section 1 will be "'"
      PN1xT hudredths of a second
     long."
250 PRINT '"  The PI terms give
     the pitch change"'"  in each
     step eq.the pitch change"'
    "  in section 1 will be PI1xPN1"
260 PRINT '"  The initial settings
     are:"'"  T=20 (hundredths of
     a second)"'"  PI1=50:PI2=-100:P
    I3=50"'"  PN1=1:PN2=1:PN3=1"

270 PRINT '"  NOTES.If the pitch
     exceeds 255 it"'"  ""folds
     over"" ie.256 becomes 0,"'
    "  276 becomes 20."'"  Similarly
     -10 becomes 246"
280 PRINT '"  If the total time
     (PN1xT)+(PN2xT)"'"  +(PN3xT)
     is less than the duration"'
    "  (D),then the sound will repea
    t to "'"  fill the time."
    :PROCpress
    :ENDPROC
290 DEF PROCamplitude
    :PRINT ''"3.AMPLITUDE TERMS."''
    "  Normally the amplitude starts
     at"'"  zero,gets louder and
     dies away."''"  The amplitude
     is controlled in "'"  four
     ""phases"":attack,decay,sustain
    "'"  and release."
300 PRINT '"  The maximum amplitude
     is 126,and the"'"  total time
     for attack+decay+sustain"'
    "  must not exceed D,the duratio
    n"'"  (which is in 20ths of
     a second.)"
310 PRINT '"  Attack length = (ALA/A
    A)xT hundredths"'"  Decay length
     = (ALD/AD)xT hundredths"'"
      Sustain length = 5x(whats
     left of D)"'"  Release time
     = (anything left)/AR"
320 PRINT '"  Initial values:AA=30:A
    D=-10:AS=0"'"  AR=-10:ALA=126:AL
    D=100"
330 PRINT '"  NOTES.There is no
```



```
      SOUND: C = 1      Channel
             A = 1      Amplitude
             P = 100    Pitch
             D = 50     Duration
ENVELOPE:

  N = 1   Number
  T = 20  Step length
PI1 = 50  Pitch change/step(section 1)
PI2 = -100Pitch change/step(section 2)
PI3 = 50  Pitch change/step(section 3)
PN1 = 1   Number of steps  (section 1)
PN2 = 1   Number of steps  (section 2)
PN3 = 1   Number of steps  (section 3)
 AA = 30  Amp.change/step in attack
 AD = -10 Amp.change/step in decay
 AS = 0   Amp.change/step in sustain
 AR = -10 Amp change/step in release
ALA = 126 Target level(end of attack)
ALD = 100 Target level(end of decay)

       ENTER <G> TO GET GRAPHS
     ENTER <I> TO GET INSTRUCTIONS
  ENTER <R> TO RESET ALL TERMS TO ZERO

Do you wish to change any factor (Y/N)
```

```
     point in going "'"  above 126
     or below 0."'"  If the amplitud
    e cannot get back to"'"  zero,th
    e sound will be continuous."
    :PROCpress
    :ENDPROC
340 DEF PROCsound
    :PRINT '''" A SOUND term must
     follow any ENVELOPE."''" This
     is in the form SOUND C,A,P,D"
350 PRINT '" C is the ""Channel"
    " and is usually"'" 1,2 or 3.(Tr
    y 0 later.)"
360 PRINT '" A is the ""Amplitude"
    " and in this "'" case it is
     the envelope number."'" Without
     an envelope it must be "'"
     between 0(silence) and -15(loud
    )."
370 PRINT '" P is the ""Pitch"",
     which is the"'" starting pitch
     if there is an"'" envelope."
380 PRINT '" D is the ""Duration"
    " in 20ths of"'" a second."
390 PRINT '" SOUND 1,1,100,50 has
```

This listing was produced using a special formatter which breaks one program line over several lines of listing. When entering a line don't press Return until you come to the next line number. Full details of the formatter are in the July 1983 issue of The Micro User.

```
     been put in the"'" programme.Yo
    u may change it later."
    :PROCpress
400 PRINT ''" There are graphs to
     guide you and to"'" show mistak
    es."''" Pressing ""G"" will
     show them."
410 PRINT '" Pressing ""N"" lets
     you hear the"'" sound."
420 PRINT '" Pressing ""I"" gets
     the instructions"'" without
     changing the values."
430 PRINT '" Pressing ""R"" resets
     all values to "'" zero, and
     allows you to put your own"'
    " figures in."
440 PRINT '" Press ESCAPE to go
     again at any time."''" Keep
     a record of any good sounds,"'
    " for future use."
    :PROCpress
    :ENDPROC
450 DEF PROCsheet
    :CLS
    :PRINT TAB(5,1);"SOUND: C =
     ";C;TAB(22,1)"Channel";
    TAB(12);"A = ";A;TAB(22)"Amplitu
    de";TAB(12);"P = ";P;TAB(22)
    "Pitch";TAB(12);"D = ";D;
    TAB(22);"Duration"
460 PRINT TAB(0,5);"ENVELOPE:"
    :PRINT
    :PRINT ;"  N = ";N;TAB(10);
```

→

Envelope listing

From Page 163

```
    "Number"
    :PRINT ;"  T = ";T;TAB(10);
    "Step length"
    :PRINT ;"PI1 = ";PI1;TAB(10);
    "Pitch change/step(section 1)"
470 PRINT :"PI2 = ";PI2;TAB(10);
    "Pitch change/step(section 2)"
    :PRINT ;"PI3 = ";PI3;TAB(10);
    "Pitch change/step(section 3)"
    :PRINT ;"PN1 = ";PN1;TAB(10);
    "Number of steps  (section 1)"
480 PRINT ;"PN2 = ";PN2;TAB(10);
    "Number of steps  (section 2)"
    :PRINT ;"PN3 = ";PN3;TAB(10);
    "Number of steps  (section 3)"
    :PRINT ;" AA = ";AA;TAB(10);
    "Amp.change/step in attack"
    :PRINT ;" AD = ";AD;TAB(10);
    "Amp.change/step in decay"
490 PRINT ;" AS = ";AS;TAB(10);
    "Amp.change/step in sustain"
    :PRINT ;" AR = ";AR;TAB(10);
    "Amp change/step in release"
    :PRINT ;"ALA = ";ALA;TAB(10);
    "Target level(end of attack)"
    :PRINT ;"ALD = ";ALD;TAB(10);
    "Target level(end of decay)"
500 PRINT TAB(7,22);"ENTER <G> TO
     GET GRAPHS";TAB(5,23);"ENTER
     <I> TO GET INSTRUCTIONS";
    TAB(1,24);"ENTER <R> TO RESET
     ALL TERMS TO ZERO"
    :ENDPROC
510 DEF PROCC
    :PROCWIPE(22)
    :PROCWIPE(24)
    :INPUT TAB(0,24)"WHICH CHANNEL
     C (0to4) ",C
    :IF C<0 OR C>4 PROCC
520 PROCsheet
    :ENDPROC
530 DEF PROCA
    :PROCWIPE(22)
    :PROCWIPE(24)
    :INPUT TAB(0,24)"WHAT AMPLITUDE
     A (-15 to 4) ",A
    :IF A>4 OR A<-15 PROCA
540 PROCsheet
    :ENDPROC
550 DEF PROCP
    :PROCWIPE(22)
    :PROCWIPE(24)
    :INPUT TAB(0,24)"WHAT PITCH
     P (0to255) ",P
    :IF P<0 OR P>255 PROCP
560 PROCsheet
    :ENDPROC
570 DEF PROCD
    :PROCWIPE(22)
    :PROCWIPE(24)
    :INPUT TAB(0,24)"WHAT DURATION
     D (1to255) ",D
    :IF D<0 OR D>255 PROCD
580 PROCsheet
    :ENDPROC
590 DEF PROCN
    :PROCWIPE(22)
    :PROCWIPE(24)
    :INPUT TAB(0,24)"ENVELOPE NUMBER
     N (1 to 4) ",N
    :IF N<1 OR N>4 PROCN
600 PROCsheet
    :ENDPROC
610 DEF PROCT
    :PROCWIPE(22)
    :PROCWIPE(24)
    :INPUT TAB(0,24)"STEP LENGTH
     T (0 to 127) in centisecs.
     ",T
    :IF T<0 OR T>127 PROCT
620 PROCsheet
    :ENDPROC
630 DEF PROCPI1
    :PROCWIPE(22)
    :PROCWIPE(24)
    :INPUT TAB(0,24)"Pitch change/st
    ep in 1st phase           (-128
     to 127) "PI1
    :IF PI1<-128 OR PI1>127
    PROCPI1
640 PROCsheet
    :ENDPROC
650 DEF PROCPI2
    :PROCWIPE(22)
    :PROCWIPE(24)
    :INPUT TAB(0,24)"Pitch change/st
    ep in 2nd phase           (-128
     to 127) "PI2
    :IF PI2<-128 OR PI1>127
    PROCPI2
660 PROCsheet
    :ENDPROC
670 DEF PROCPI3
    :PROCWIPE(22)
    :PROCWIPE(24)
    :INPUT TAB(0,24)"Pitch change/st
    ep in 3rd phase           (-128
     to 127) "PI3
    :IF PI3<-128 OR PI1>127
    PROCPI3
680 PROCsheet
    :ENDPROC
690 DEF PROCPN1
    :PROCWIPE(22)
    :PROCWIPE(24)
    :INPUT TAB(0,24)"Number of steps
     (0 to 255)               in
     1st phase. ",PN1
    :IF PN1<0 OR PN1>255 PROCPN1
700 PROCsheet
    :ENDPROC
710 DEF PROCPN2
    :PROCWIPE(22)
    :PROCWIPE(24)
    :INPUT TAB(0,24)"Number of steps
     (0 to 255)               in
     2nd p(ase. ",PN2
    :IF PN2<0 OR PN2>255 PROCPN2
720 PROCsheet
    :ENDPROC
730 DEF PROCPN3
    :PROCWIPE(22)
    :PROCWIPE(24)
    :INPUT TAB(0,24)"Number of steps
     (0 to 255)               in
     3rd phase. ",PN3
    :IF PN3<0 OR PN3>255 PROCPN3
740 PROCsheet
    :ENDPROC
750 DEF PROCAA
    :PROCWIPE(22)
    :PROCWIPE(24)
    :INPUT TAB(0,24)"Change of ampli
    tude per step during     attack
     phase (-127 to 127) ",AA
    :IF AA<-127 OR AA>127 PROCAA
760 PROCsheet
    :ENDPROC
770 DEF PROCAD
    :PROCWIPE(22)
    :PROCWIPE(24)
    :
    :INPUT TAB(0,24)"Change of ampli
    tude per step during      decay
     phase (-127 to 127) ",AD
    :IF AD<-127 OR AD>127 PROCAD
780 PROCsheet
    :ENDPROC
790 DEF PROCAS
    :PROCWIPE(22)
    :PROCWIPE(24)
    :INPUT TAB(0,24)"Change of ampli
    tude per step during    sustain
     phase (-127 to 0) ",AS
    :IF AS<-127 OR AS>0 PROCAS
800 PROCsheet
    :ENDPROC
810 DEF PROCAR
    :PROCWIPE(22)
    :PROCWIPE(24)
```

→

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October issue
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November issue
Beginners: guide to character codes. Light Pen, more useful software. Forth ROM reviewed. Blackjack, a compulsive simulation of the card game. Putting Basic programs into sideways ROMs. Goblins, a fun packed enchanted journey. Body Building Part 9, projects for the Physics lab. The SOUND command explained, Part 1. Games design: improve your programs.

December issue
Tower Bridge – ghostly encounters in the nation's capital. Paged Graphics: 6845 animation techniques. Character Definer an indispensible utility. Smartmouth reviewed. Sound explained, part 2. Body Building, a sound-to-pattern converter. Beginners, working with strings. Slow Down, alters pace of your programs. Graphics: User defined characters. Santa's Saucer and Christmas Card.

January issue
Barrel Battle – an all action arcade game. Graphics, an easy to follow introduction to multiplane images. Noteplay, an entertaining musical utility. Body Building: add a DFS to your micro. Printing, Pixels, a multitone screen dump for Epson printers. Sound advice, flushing sound queues. Beginners, the use of TAB. Adventures, our regular column begins. Bits and Bytes investigates binary operations.

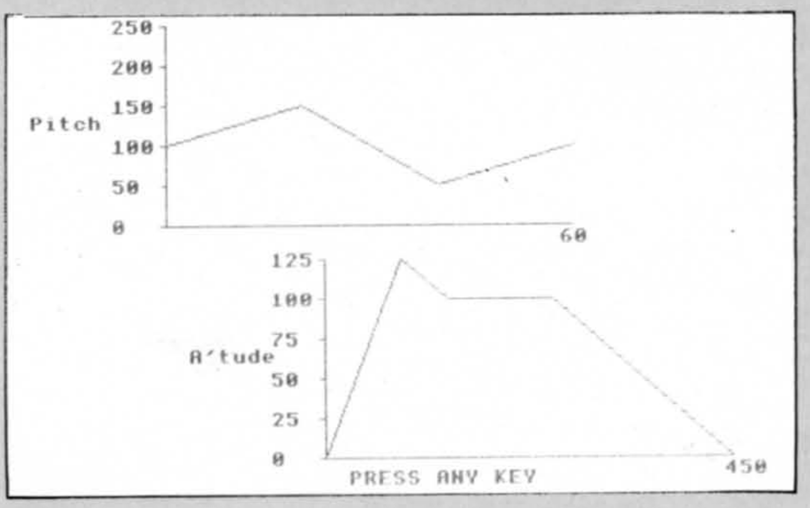
February issue
Alien Invasion – Mode 7 action in this arcade blockbuster. Frogs'n'Dogs, a delightful game for all the family. Number Balance – simple sums for children. Body Building, a real time clock. Sound Shaper, an easy-to-use envelope generator. Single Key Entry, save wear and tear on your fingers. DIY ROM board, full constructional details. Gallery, an intriguing logic game. Sound Advice, synchronising channels.

March Issue
Mazemunch, an explosive version of the all-time arcade hit. Birthday, our fun-packed anniversary game. Denary Derek, number fun for infants. Recovery, a routine to restore Bad Programs. Body Building, turn your micro into an oscilloscope. Light Pen, we give you single pixel resolution. Network, transferring programs between several BBC Micros. PLUS a 32 page special on discs.

April issue
Microgolf, a simulation of a day on the links. Eastermaze, a seasonal chick-chasing game. Sound Library, create a library of sounds. Owl, a display of computer graphics. RS432 communications software. Body Building, build a heart rate monitor. Seawall and Magic Squares, two educational programs. Programmers' Workshop, making the most of DIM. Sound Advice, envelopes made easy.

Envelope listing

From Page 164



```
    :INPUT TAB(0,24)"Change of ampli
    tude per step during     release
     phase (-127 to 0) ",AR
    :IF AR<-127 OR AR>0 PROCAR
820 PROCsheet
    :ENDPROC
830 DEF PROCALA
    :PROCWIPE(22)
    :PROCWIPE(24)
    :INPUT TAB(0,24)"Target level
     at end of attack phase
     (0to126) ",ALA
    :IF ALA<0 OR ALA>126 PROCALA
840 PROCsheet
    :ENDPROC
850 DEF PROCALD
    :PROCWIPE(22)
    :PROCWIPE(24)
    :INPUT TAB(0,24)"Target level
     at end of decay phase
     (0to126) ",ALD
    :IF ALD<0 OR ALD>126 PROCALD
860 PROCsheet
    :ENDPROC
870 DEF PROCplaysound
    :ENVELOPE N,T,PI1,PI2,PI3,PN1
    ,PN2,PN3,AA,AD,AS,AR,ALA,ALD
    :SOUND C,A,P,D
    :ENDPROC
880 DEF PROCchoice
    :PROCWIPE(25)
    :PRINT TAB(0,26);"Do you wish
     to change any factor (Y/N)
     "
890 G$=GET$
900 IF G$="G" PROCgraph
    :ENDPROC
910 IF G$="I" CLS
    :GOTO 90
    :ENDPROC
920 IF G$="R" PROCreset
    :ENDPROC
930 IF G$="Y" PROCchange
    :PROCchoice
    :ENDPROC
940 IF G$="N" PROCplaysound
    :PROCchoice
    :ENDPROC
950 IF G$<>"Y" AND G$<>"N" AND G$<>
    "G"AND G$<>"I" AND G$<>"R"
     PROCchoice
    :ENDPROC
960 DEF PROCchange
    :PROCsheet
    :INPUT TAB(1,26)"Which factor
     do you wish to change ",J$
     :PROCWIPE(23)
     :PROCWIPE(25)
970 IF J$="G" PROCgraph
     :ENDPROC
980 IF J$="I" CLS
     :GOTO 90
     :ENDPROC
990 IF J$="R" PROCreset
     :ENDPROC
1000 IF J$="C" PROCC
     :ENDPROC
1010 IF J$="A" PROCA
     :ENDPROC
1020 IF J$="P" PROCP
     :ENDPROC
1030 IF J$="D" PROCD
     :ENDPROC
1040 IF J$="N" PROCN
     :ENDPROC
1050 IF J$="T" PROCT
     :ENDPROC
1060 IF J$="PI1" PROCPI1
     :ENDPROC
1070 IF J$="PI2" PROCPI2
     :ENDPROC
1080 IF J$="PI3" PROCPI3
     :ENDPROC
1090 IF J$="PN1" PROCPN1
     :ENDPROC
1100 IF J$="PN2" PROCPN2
     :ENDPROC
1110 IF J$="PN3" PROCPN3
     :ENDPROC
1120 IF J$="AA" PROCAA
     :ENDPROC
1130 IF J$="AD" PROCAD
     :ENDPROC
1140 IF J$="AS" PROCAS
     :ENDPROC
1150 IF J$="AR" PROCAR
     :ENDPROC
1160 IF J$="ALA" PROCALA
     :ENDPROC
1170 IF J$="ALD" PROCALD
     :ENDPROC
1180 IF J$<>"C" AND J$<>"A" AND J$<>
     "P"AND J$<>"D" AND J$<>"N"
      AND J$<>"T" AND J$<>"PI1"
      AND J$<>"PI2" AND J$<>"PI3"
      AND J$<>"PN1" AND J$<>"PN2"
      AND J$<>"PN3" AND J$<>"AA"
      AND J$<>"AD" AND J$<>"AS"
      AND J$<>"AR" AND J$<>"ALA"
      AND J$<>"ALD"
1190 IF J$<>"I" AND J$<>"R" PROCchange
1200 ENDPROC
1210 DEF PROCgraph
     :CLS
1220 VDU 5
     :MOVE 0,820
     :PRINT "Pitch"
1230 MOVE 300,1000
     :DRAW 300,600
     :DRAW 1200,600
1240 M=0
     :FOR Y=0 TO 400 STEP 80
     :MOVE 180,615+Y
     :PRINT ;M
     :MOVE 290,600+Y
     :DRAW 300,600+Y
     :M=M+50
     :NEXT
1250 IF T=0 t=1
     ELSE t=T
1260 Ttime=(PN1+PN2+PN3)*t
     :IF Ttime=0 GOTO 1400
```

Envelope listing

From Page 167

```
1270 XT=900/Ttime
1280 YT=400/250
1290 MOVE 290,590
     :MOVE 270+(PN1+PN2+PN3)*t*XT
     ,590
     :PRINT ;(PN1+PN2+PN3)*t
1300 MOVE 300,600+P*YT
1310 FOR X=0 TO 10*PN1
     :PX2%=300+((X*t*XT)/10)
     :PY2%=600+((P+((PI1*X)/10))
     MOD 256)*YT
     :IF PY2%>600
     :PLOT 5,PX2%,PY2%
1320 IF PY2%<600 PLOT 5,PX2%,400+PY2%
1330 NEXT
1340 FOR X=0 TO 10*PN2
     :PX3%=300+(PN1+X/10)*t*XT
     :PY3%=600+((P+(PI1*PN1)+((PI2*X)
     /10))MOD 256)*YT
     :IF PY3%>600
     :PLOT 5,PX3%,PY3%
1350 IF PY3%<600 PLOT 5,PX3%,400+PY3%
1360 NEXT
1370 FOR X=0 TO 10*PN3
     :PX4%=300+(PN1+PN2+X/10)*t*XT
     :PY4%=600+((P+(PI1*PN1)+(PI2*PN2
     )+((PI3*X)/10)) MOD 256)*YT
     :IF PY4%>600
     :PLOT 5,PX4%,PY4%
1380 IF PY4%<600 PLOT 5,PX4%,400+(PY4
     %)
1390 NEXT
1400 MOVE 0,320
     :PRINT "A'tude"
1410 MOVE 300,500
     :DRAW 300,100
     :DRAW 1200,100
1420 L=0
     :FOR Y=0 TO 400 STEP 80
     :MOVE 180,115+Y
     :PRINT ;L
     :MOVE 290,100+Y
     :DRAW 300,100+Y
     :L=L+25
     :NEXT
1430 AT1%=T*ALA/AA:
1440 IF AD=0 AT2%=0
     ELSE AT2%=T*ABS (ALA-ALD)/
     ABS (AD)
1450 AT3%=(100*D/20)-AT1%-AT2%
1460 IF AR=0 AT4%=0
     ELSE AT4%=T*(ALD+(AS*AT3%))/
     ABS (AR)
1470 Atime=AT1%+AT2%+AT3%+AT4%
1480 XT=900/Atime
1490 MOVE 280+(AT1%+AT2%+AT3%+AT4%)*X
     T,90
     :PRINT ;AT1%+AT2%+AT3%+AT4%
1500 YT=400/125
1510 MOVE 300,100
     :DRAW 300+AT1%*XT,100+ALA*YT
     :DRAW 300+(AT1%+AT2%)*XT,100+ALD
     *YT
     :DRAW 300+(AT1%+AT2%+AT3%)*XT
     ,100+(ALD+(AS*AT3%))*YT
1520 IF AR<>0 DRAW 300+(AT1%+AT2%+AT3
     %+AT4%)*XT,100
     ELSE MOVE 400,300
     :PRINT "AR=0 Continuous note!"
1530 VDU 4
1540 IF AT3%<-1 PRINT TAB(15,0);
     "Press <SPC>"
     :G$=GET$
     :PROCNO1
     :PROCREGO
1550 IF ALA<0 OR ALA>126 OR ALD<0
      OR ALD>126 OR (ALD+(AS*AT3%))<0
      OR (ALD+(AS*AT3%))>126
     PRINT TAB(15,0);"Press <SPC>"
     :G$=GET$
     :PROCNO2
     :PROCREGO
1560 PROCpress
     :PROCsheet
     :
     :PROCchoice
     :ENDPROC
1570 DEF PROCNO1
     :CLS
     :PRINT ''''"You have made a
      mistake such that the   attack
      phase and the decay phase last
        longer than the duration
      D of the sound."'"The easy
      way to fix this is to increase
      the duration D,but increasing
      AA,or AD"
1580 PRINT "will also help."
     :ENDPROC
1590 DEF PROCNO2
     :CLS
     :PRINT ''''"You have made a
      mistake such that the   amplitu
     de is less than zero,or more
      than126."''"Check that your
      values of AA,AD,AS or ARare
      not too great."
     :ENDPROC
1600 DEF PROCREGO
     :PRINT '"Press <G> to go back
      to the graphs."''"Press <Any
      key> to look at your values."
     :G$=GET$
     :IF G$="G" PROCgraph
     ELSE PROCsheet
     :PROCchoice
     :ENDPROC
1610 DEF PROCreset
     :PROCinit
1620 PROCsheet
     :PROCC
     :PROCA
     :PROCP
     :PROCD
     :PROCN
     :PROCT
     :PROCPI1
     :PROCPI2
     :PROCPI3
     :PROCPN1
     :PROCPN2
     :PROCPN3
     :PROCAA
     :PROCAD
     :PROCAS
     :PROCAR
     :PROCALA
     :PROCALD
     :PROCplaysound
     :PROCchoice
     :ENDPROC
1630 DEF PROCpress
     :PRINT TAB(11,30)"PRESS ANY
      KEY"
     :G=GET
     :CLS
     :ENDPROC
1640 DEF PROCWIPE(X)
     :PRINT TAB(0,X);SPC (80)
     :ENDPROC
1650 DEF PROCerr
     :IF ERR =17 ENDPROC
1660 *FX12,0
1670 *FX12,3
1680 VDU 4
     :REPORT
     :PRINT " In line "ERL
1690 ENDPROC
1700 DATA 1,1,100,50,1,20,50,-100
     ,50,1,1,1,30,-10,0,-10,126
     ,100
1710 DATA 0,0,0,0,0,0,0,0,0,0,0
     ,0,0,0,0,0,0,0
```

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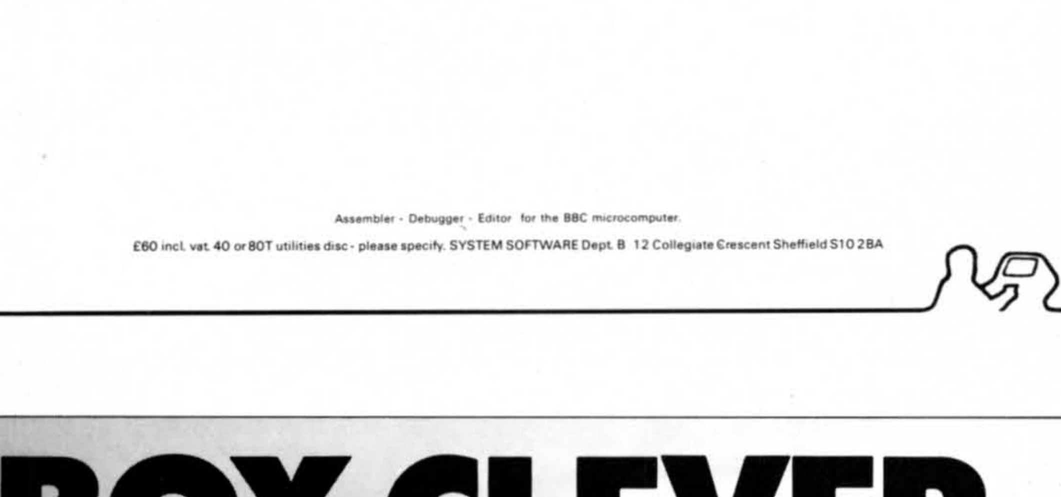
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PROGRAMMERS' WORKSHOP

Second try at a partial renumber program

ONE of the features lacking in the Basic ROM on the BBC Micro is a partial renumber facility. This enables you to renumber part of a program, such as resetting all procedures to start on a multiple of line 1000.

By ROBIN NEWMAN

Although Basic programs have been published to perform this task they tend to be rather slow. So it was decided to write a machine code utility instead.

A renumber program is not easy to write. Not only do you have to change all the line numbers, but you also have to deal with any GOTO, GOSUB, etc, contained within the body of the program.

The initial work on this program was done by Sandy Nelson, who decided to see how Acorn had tackled RENUMBER within the Basic ROM.

The Token program by Jim Notman (*The Micro User*, April 1983) gives the Action Address for RENUMBER as &8F37 for Basic I (it is &8FA3 for Basic II).

Disassembly of the ROM showed that the renumber process split into four sections:

1. Validation of the renumber parameters.
2. Setting up a list of existing line numbers from Top upwards.
3. Renumbering the line numbers at the start of each line in the program.
4. Searching through the body of the program for line numbers after GOTO, etc, and renumbering them with the aid of the list of old line numbers starting at Top.

For the partial renumber program steps one and three would be different. Four parameters would be required, not two, and they would require more extensive checking for overlap, etc.

Also in step three only those line numbers within the specified renumber range would require to be changed, not the whole lot. However the bulk of the process would be the same.

Therefore it was decided to make use of existing routines within the Basic ROM to make the job easier and to use less valuable RAM space.

Sandy, a former pupil of mine, produced a working version of the program in 1982. However it had various shortcomings.

All four parameters had to be included – REN. F,I,S,E where F was the first new line number, I the new increment and S and E the Start and End of the range to be renumbered.

The fact that E could not be missed out and that S and E had to be existing line numbers made the program unwieldy to use in practice. You had to list the program to find out what values you wished to put in.

More serious was the fact that there was very little checking against overlapping occurring in the renumber.

Thus REN. 10,1,20,40 should have been rejected for a program which initially contained lines 10 to 100 in steps of 10. Instead the result was lines 10,10,11,12,50,60, etc.

Finally to cap it all Basic II appeared on the scene and the program would not work at all on that.

Having left the program to gather dust for many months I was driven back to it because of the frustration of using a Basic version. I decided on the following requirements:

- The program had to work equally on Basic I and II.
- Full validation had to be applied to the renumber parameters, so that no overlap errors could occur.
- If the S line input did not exist the next existing line number should be selected for the start of the renumber range. Similarly, if the E line input did not exist the previous highest existing line number should be selected.
- The E parameter should be optional. If missed out, the utility should renumber to the end of the program being operated on.

All of these factors are satisfied in the final version.

The program listing is fairly heavily commented and REMed, but perhaps an overall view of its operation will aid understanding.

First those of you who have already sneaked a preview of the listing (does anybody read the waffle before they try out something new?) will have seen that Sandy included some icing on the cake in the original program.

One problem that tape users know well is the lack of a VERIFY function to check whether a program can be read back from a tape without destroying the original program.

The well known dodge of using *LOAD"*progname*"8000 is incorporated into this utility using the syntax VERIFY"*progname*". This will then test whether the file can be read satisfactorily.

The facility works equally well with disc files, although it is less likely to be needed unless you are very perverse with your discs.

The two additional commands are entered by intercepting the BRK vector

→

From Page 171

which is used whenever an error occurs in Basic.

Since the syntax of the additional commands is non-standard this will occur whenever either of them is invoked.

Thus the first section of code (lines 360-430) changes the contents of this vector to point to the new utility so that all subsequent errors are routed to it.

It then gives a message to this effect on the screen.

Lines 440-490 do an initial check on the type of error that has invoked a call to the routine.

REN. with three or four parameters will cause a syntax error (error number &10) and VERIFY will cause a mistake error (error number 4).

Any other errors are filtered out and passed on to the normal error handling routines in lines 490, 1160 and 1170.

Note the code in line 1170 which tests which Basic chip, I or II, is present and jumps to the appropriate address by testing the first byte in the Basic ROM. This is &4C and hence positive in Basic I and &C9 and negative in Basic II.

This coding occurs wherever a direct jump is made into the Basic ROM, and the alternative addresses used are listed in lines 170-220.

If a "mistake" error has been generated then lines 520-600 check for the word VERIFY, ignoring any leading spaces. If this is not found the utility exits as above (line 600).

'If less than three parameters are present . . . no error will occur . . .'

Assuming that a match is found, the utility next checks for a filename inside inverted commas, again ignoring leading spaces (lines 610-690), exiting via commaerr (line 500) if the second comma is absent, and then loads the name into a parameter block for use with the OSFILE command (see page 454-6 of the User Guide).

The parameter block is set up in lines 720-750 to read the file specified into a data buffer at &8000 out of harm's way.

If this succeeds without generating further error then the file is okay on the storage media used, and the utility returns to the appropriate Basic warm start address.

If the original error is a syntax one, then the utility jumps to lines 800-820 where it checks to see if there is a RENUMBER token (&CC) in the Basic input command buffer at &700. Again leading spaces are ignored.

If a renumber token is not found then it jumps to the normal error handler as before.

The four stages of the renumber process now proceed. First the four (or three) input line numbers are extracted from the input buffer, where they will reside in a special coded format.

This is used by the Basic input routine so that line numbers within program lines after GOTO, etc, can be easily identified by means of an &8D character which is followed by four coded bytes, no matter what the size of the line number.

In this case the process has to be reversed. Lines 830-930 together with the lines 1000-1090 perform this task, using almost identical code to that employed in the Basic ROM.

The four line numbers produced are stored in p1 to p4, the X register being used both as a decreasing counter, and as a pointer to the next parameter location to be used.

If X contains two on exit from line 930 then it means that only three parameters have been found.

The utility then enters 32767 which is the highest possible legal line number into p4, thus ensuring that the renumber range extends to the end of the program being processed.

If less than three parameters are present then the normal RENUMBER command will be used, and no error will occur to access this utility.

On the other hand if there are more than four parameters then the extra ones are ignored as the loop is exited when X=0 – that is, after four parameters (lines 860-870).

A check is made to see whether the E line number is bigger than the S line. If not exit is made to Basic's "Arguments" error.

Line 1200 checks that the Basic program is intact so that the line pointers link through from Page to Top using an inbuilt ROM routine. If not a "Bad Program" error terminates the renumber.

Now stage two of the renumber process takes place. A table of existing line numbers is set up from Top upwards (lines 1220-1510) using similar code to that employed in the ROM.

However a record is also kept in finaline of a pointer to the latest line number found in the program, so that on exit from this section it will point to the last line number existing in the program (see line 1320).

Note also the check made to see that there is still room for more entries in this table by comparing the table pointer with &6 and &7 which contain HIMEM.

If there isn't then a Renumber space error is issued and the renumber is aborted (lines 1450-1510).

The next job is to note the actual start and end line numbers for the renumber. For example, if S is 15 and existing line numbers are 10, 20, 30, 40, etc, then 20 must be selected for the start of the range.

Similarly if E is 35 then the end of the range must be line 30.

A search is made for E (contained in p4) first, using the subroutine findlin.

'. . . there is no problem with any overlap at the start of the renumber range'.

Location lnflag is first set to 0 (line 1620) so that if there is no exact match the previous line will be taken (lines 2500-2780).

Detail on the use of this subroutine is provided in the comments in the program.

On return from this routine the pointer to this line in the program is transferred from oslp to ospointer (lines 1630-40), and then S is shifted from p3 to p4 so that it in turn can be searched for. Also F is transferred from p1 to p3 (lines 1660-1730).

The subroutine findlin is used again to search for S (p4), but this time lnflag contains 1, so that if an exact match is not found then the first line existing after S is selected as illustrated above (lines 1740-1760).

On exit from findlin the location prevlin will point to the previous line to that which was selected by the routine, or to the first line in the program if that number was selected.

In the latter case there is no problem with any overlap at the start of the renumber range (lines 1780-1830), but if not then p3 which contains F is compared with the number pointed to by prevlin (lines 1850-1910).

If it is greater then there is no problem, otherwise the utility exits via argerr2 (line 2250) which prints out the word clash and then jumps to an "arguments" error (line 1140).

Note that in this line ospointer is first set to zero. This is so that an accompanying "at line . . ." message is not produced, as ospointer is used by

→

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data tap

88 Willowhayne Drive, Walton-on-Thames, Surrey, KT12 2NR

From Page 172

the error routine to print out the error line number.

Having dealt with the beginning of the renumber range, we now have to check for possible overlap at the end of the range. This is done by performing a dummy run renumber (lines 1930-2110).

The utility starts at the beginning of the renumber range (pointed to by oslp) and goes round a loop which adds I (p2) to the current new line number (in p1) each time until the end of the renumber range (pointed to by ospointer) is reached.

The subroutine add (lines 2990-3020) is used to increment the pointer oslp on each iteration of the loop. It also affects prevlin, but this is not used again so it doesn't matter.

On reaching the label exit p1 will contain the last new line number that the renumber will generate.

In order to see whether it overlaps any remaining line numbers in the original program, oslp is changed once more, using the subroutine add, so that it points to the next line number after the end of the renumber range.

If there isn't one it will point to the &FF terminator at the end of the program and the byte following it, which by a happy chance will give a "line number" greater than 32767, the maximum legal value, because in this case there will not be any overlap.

Line 2180 stores the result in lnafterend, and this is then compared with p1 which contains the last new line number.

If lnafterend is greater then there is no clash, otherwise a clash exit occurs as before.

Now that the parameter checking is complete the renumber can proceed in earnest. Section three is repeated, for real this time, the new line numbers overwriting the old ones at the start of each program line.

This is carried out by lines 2270-2400. Note in line 2300 p1 is set back to the value of F which has been stored in p3 in line 1680, so that the renumber starts with the correct first new line number.

The remainder of the process – the hard bit which deals with GOTO, etc, is thankfully the same as for a normal renumber command, and so it can be safely left to the Basic ROM to carry it out.

'... it will clobber itself as it attempts to place the assembled code on top of itself. Very nasty'.

The process is sent on its merry way by jumping into the ROM for the final time at line 2460.

Finally all that remains is to discuss where to put the utility. As listed it is assembled at &A00 for use on a disc system.

However tape users will find that this is not very desirable as it occupies the cassette output buffer.

Disc users may also object to losing the use of their user defined keys and any user defined characters, both of which should not be used while the utility is in operation, as it occupies nearly &300 hex and covers pages &A00 to &C00 inclusive.

For this reason pushing the Break key will produce a strange pattern of bytes, and should be followed by pushing the Escape key if the code is assembled here.

Alternatives, which are achieved by altering line 330, are to set P% to the default value of Page for your machine (&E00 for tape machine, &1900 for disc machine, &1200 for econet, &1B00 for econet+disc ...) and to set PAGE &300 higher for your Basic program.

In this case it is important to realise two things. First don't forget to load this program at the new Page setting *before* attempting to run it, otherwise it will clobber itself as it attempts to place the assembled code on top of itself. Very nasty.

Secondly, the first two bytes are set to &OD &FF, so that if Break is pushed it does not clobber the utility and you can regain your Basic program by typing PAGE=PAGE+&300.

Note however that the utility will have to be reconnected by typing CALL &xxxx where xxxx is the entry address which will be two above your original page setting, for example &E02, &1902, &1202, &1B02 etc.

The third alternative is to set P% to &7900 and HIMEM to &7900. The renumber utility will then reside at the top of memory.

Call &7902 can be used to reconnect it after Break, and HIMEM should also be reset to &7900. However in this case you must not select any other mode than 7.

If you are daunted by the task of typing in this fairly long listing you can leave out all the REMs and comment statements (following /) in the assembler, which will considerably shorten the task.

After running the program the assembled code can be saved separately by copying the *SAVE line printed on the screen by line 3260.

Line 3270 gives the CALL command to reconnect after BREAK.

When the assembled code has been saved then the command *RUN RENMC will install it without having to reload the Basic source code program.

Renumber listing

This listing was produced using a special formatter which breaks one program line over several lines of listing. When entering a line don't press Return until you come to the next line number. Full details of the formatter are in the July 1983 issue of The Micro User.

```
10 REM RENUM (version 2)
20 REM Program to improve renumber
30 REM facility and add VERIFY
    function
40 REM By Sandy Nelson & Robin
    Newman
50 REM (C) 1984
60 REM MICRO USER
70 REM
80 REM Syntax
    : RENUMBER F,I,S,E
90 REM F=First new linenumber
    : I=new line Increment
100 REM S=Start of renumber range
    :E=End of renumber range
110 REM If E is omitted then the
    rest of the program is taken
    for range
120 REM RENUMBER can be abbreviated
    to REN.
130 REM
140 REM Syntax
    : VERIFY"filename"
150 REM checks whether filename
```

Renumber listing

```
     can be read into memory without
     error.
160 REM
170 REM Basic II entry points
180 err=&B402
    :warm=&8AF3
    :arg=&B2BE
    :spacerr=&8FD6
    :contren=&900D
190 nolinerr=&B9B5
    :bumplineptr=&909F
    :relink=&BE6F
    :miscomma=&8E98
200 REM Basic I entry points
210 err1=&B433
    :warm1=&8A96
    :arg1=&B2ED
    :spacerr1=&8F78
    :contren1=&8FAD
220 nolinerr1=&B9D3
    :bumplineptr1=&9052
    :relink1=&BE88
    :miscomma1=&8E32
230 REM other variables...
240 ospointer=&B
    :p4=&2A
    :p3=&2C
    :p2=&2E
    :p1=&30
250 ospointer2=&3B
    :lnafterend=&32
    :oslp=&37
260 finalin=&70
    :lnflag=&72
    :prevlin=&73
270 blk=&70
    :page=&18
    :top=&12
    :basic=&8000
280 osfile=&FFDD
    :filebuff=&50
    :buff=&700
290 osasci=&FFE3
    :oswrch=&FFEE
300 FOR Z=0TO 3STEP 2
310 REM Reset P% as appropriate
     eg &E00,&1900; NB reset PAGE
     if necessary
320 REM First two locations set
     to &0D &FF so that any reset
     does not corrupt
330 P%=&A00
340 !P%=&FF0D
    :P%=P%+2
350 [OPT Z
360 \ intercept BRK error handler
     at &202,&203
370 \
380 .connect LDA #start MOD 256
    :STA &202 \ Lo
390 LDA #start DIV 256
    :STA &203 \ Hi
400 LDY #(data-mess-1)AND &FF
410 .rep LDA mess,Y
    :JSR osasci
    :DEY
420 BPL rep
    :LDA #7
    :JMP oswrch
430 \
440 \ check cause of "error"pointed
     to by &FD
450 \
460 .start LDY #00
    :LDA (&FD),Y
470 CMP #&10
    :BEQ could \ Syntax error generat
    ed, so could be RENUMBER
480 CMP #4
    :BEQ cbverf \ Mistake error
    , so could be a VERIFY
490 .error JMP normerror \ exit
     via normal error handler
500 .commaerr BIT basic
    :BPL P%+5
    :JMP miscomma
    :JMP miscomma1 \ missing comma
     err.
510 \
520 \ VERIFY handler follows...
530 \
540 .cbverf LDX#&FF
    :LDY #&FF
550 JSR spskp \ Skip spaces
560 DEY \ Reset Y to point to V
570 .vrsv INY
    :INX \ Check syntax ie VERIFY
     plus "filename"
580 LDA buff,Y
    :CMP data,X
590 BEQ vrsv
600 CPX #6
    :BNE error \ Mismatch must occur
     when X=6
610 DEY \ Reset Y (as above)
620 JSR spskp
630 CMP #ASC """"
    :BNE error
640 LDX #&FF
650 .vrfn INX
    :INY \ Read in file name
660 LDA buff,Y
    :CMP#13
    :BEQ commaerr
    :CMP #ASC """"
    :BEQ vfin \ check for 2nd comma
670 STA filebuff,X
    :BNE vrfn
680 .vfin LDA #&D
    :STA filebuff,X
690 \
700 \ file is loaded at &8000 out
     of harms way
710 \
720 LDA#filebuff MOD 256
    :STA blk
    :LDA #filebuff DIV 256
    :STA blk+1
730 LDA #&80
    :STA blk+3
    :STA blk+4 \ Set up control
     block
740 LDA #0
    :STA blk+2
    :STA blk+4
    :STA blk+5
    :STA blk+6
    :TAY
750 LDA #&FF
    :LDX #blk MOD 256
    :LDY #blk DIV 256
    :JSR osfile
760 LDA #&D
    :STA buff
    :BIT basic
    :BPL P%+5
    :JMP warm
    :JMP warm1 \ Warm start BASIC
770 \
780 \ RENUMBER handler follows...
790 \
800 .could LDY #&FF \ Check to see
     if RENUMBER token &CC in buffer
810 .next JSRspskp
820 CMP #&CC
    :BEQ ren
    :JMP normerror \ Not a RENUMBER
830 .ren LDA #buff MOD 256
    :STA ospointer \ Initialise
     pointer to input line
840 LDA #buff DIV 256
    :STA ospointer+1
850 LDY #0
    :LDX #8
860 .loop INY
    :LDA (ospointer),Y
    :CPX #0
870 BEQ success
880 \
890 \ line numbers stored in coded
     form
900 \ in input buffer: &8D plus
     4 bytes
910 \
920 CMP #&8D
```

→

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Renumber listing

From Page 175

```
     :BEQ num \ A line number
 930 CMP #&0D
     :BNE loop \ Not finished scan
      of line
 940 \
 950 \ if 4th parameter missing (x=2)
      then add default 32767
 960 \
 970 CPX#2
     :BNE success
     :LDA#&7F
     :STAp4
     :LDA#&FF
     :STAp4+1
     :BMIsuccess \ force branch
 980 \ all parameters now read in
      so branch to label success
 990 \
1000 .num INY
     :LDA (ospointer),Y
     :DEX \ Decodes line number to
      normal binary
1010 ASL A
     :ASL A
     :PHA
     :AND #&C0
1020 INY
     :EOR (ospointer),Y
     :STA p4,X
1030 DEX
     :PLA
     :ASL A
     :ASL A
     :INY
1040 EOR (ospointer),Y
     :STA p4,X
1050 \
1060 \ decoded number stored in p1
      to p4
1070 \ X decreases by 2 each number
      decoded
1080 \
1090 JMP loop
1100 \
1110 \ ospointer is set to 0 before
      exit via arg error routine
1120 \ so that no "at line ...."will
      be printed; input buffer is
      also flushed
1130 \
1140 .argerr LDA #&D
     :STA buff
     :LDA#0
     :STAospointer
     :STAospointer+1
1150 BIT basic
     :BPL P%+5
     :JMP arg
     :JMP arg1 \ ARGS error
1160 .normerror LDA #&D
     :STA buff \ clear input buffer
1170 BIT basic
     :BPL P%+5
     :JMP err
     :JMP err1 \ Normal error handler
1180 .success LDA p3
     :CMP p4
     :BCC noerr \ Check p4>p3 ie
      end ) start
1190 LDA p3+1
     :CMP p4+1
     :BCS argerr
1200 .noerr JSR relink \ Make sure
      program ok, ie lines link from
      page to top
1210 \
1220 \ set up table of existing line
      numbers from TO P upwards
1230 \ oslp points to linenumber
      in program
1240 \ ospointer2 points to linenumber
      in table
1250 \
1260 LDA page
     :STA oslp+1
1270 LDX #01
     :STX oslp
1280 LDA top
     :STA ospointer2
1290 LDA top+1
     :STAospointer2+1
1300 .next LDY #00
     :LDA (oslp),Y
     :BMI end \ branch when end of
      prog reached
1310 PHA \ save A on stack
1320 LDAoslp
     :STAfinalin
     :LDAoslp+1
     :STAfinalin+1
1330 \
1340 \ finalin points to last line
      number found
1350 \
1360 \ now shift pointers; add 2
      to ospointer2,
1370 \ use ROM routine bumplineptr
      for oslp
1380 \
1390 PLA \ restore A from stack
1400 STA (ospointer2),Y
     :INY
     :LDA (oslp),Y
1410 STA (ospointer2),Y
     :CLC
     :LDA ospointer2
     :ADC #02
1420 STA ospointer2
     :TAX
     :LDA ospointer2+1
     :ADC#0
1430 STA ospointer2+1
1440 \
1450 \ check if room for more entries
      in table
1460 \ if OK then branch back for
      next line
1470 \
1480 CPX &06
     :SBC &07
     :BCS ensp
1490 BIT basic
     :BPL bp1
     :JSR bumplineptr
     :JMP bp2
1500 .bp1 JSR bumplineptr1
     :.bp2 BCC next
1510 .ensp BIT basic
     :BPL P%+5
     :JMP spacerr
     :JMP spacerr1 \ Issue space
      err.
1520 .end
1530 \
1540 \ now search for line contained
      in p4 (end of renumber range)
1550 \ set lnflag=0 first; this will
      cause the highest line-number
1560 \ existing previous to that
      contained in p4 to be selected
1570 \ if an exact match is not found.
1580 \ Note p4 will contain 32767
      if no 4th parameter was supplied
1590 \ and in this case the last
      line number in the program
1600 \ will be selected
1610 \
1620 LDA#0
     :STAlnflag
     :JSR findlin
1630 LDA oslp
     :STA ospointer \ ospointer points
      to end
1640 LDA oslp+1
     :STA ospointer+1 \ of renumber
      range
1650 \
1660 \ now shift parameters
1670 \ p3 (start of renum. range)
      to p4
```

Renumber listing

From Page 177

```
1680 \ p1 (first new line number)
      to p3
1690 \
1700 LDA p3+1
     :STA p4+1
1710 LDA p3
     :STA p4
1720 LDA p1
     :STA p3
     :LDAp1+1
     :STA p3+1
1730 \
1740 \ Now find line contained in
      p4 (start of renum. range)
1750 \
1760 JSR findlin \ on exit oslp points
      to line selected
1770 \
1780 \ if prevlin and oslp are equal
      then they must point
1790 \ to the first line in the progra
     m. In this case
1800 \ there is no problem with possib
     le line overlap
1810 \ at the start of the renumber
      range so branch to again
1820 \
1830 LDAprevlin
     :CMPoslp
     :BNE ovlaptst
     :LDAprevlin+1
     :CMPoslp+1
     :BEQagain
1840 \
1850 \ prevlin and oslp differ, so
      check p3 (first new line number)
      is
1860 \ greater than line pointed
      to by prevlin (the last
1870 \ line number before the renumber
      range)
1880 \ If not branch to argerr2 (Clash
      error)
1890 \
1900 .ovlaptst LDY#0
     :LDA(prevlin),Y
     :CMPp3
     :BCC again
1910 INY
     :LDA(prevlin),Y
     :CMPp3+1
     :BCS argerr2
1920 \
1930 \ now do a dummy renumber to
      calculate the last
1940 \ new line number generated
1950 .again
1960 \ at this point p1 & p1+1 contain
      the latest new line number
1970 \ calculated
1980 \ check if end of renumber range
      (pointed to by ospointer)
1990 \ has been reached. If so branch
      to exit
2000 \
2010 LDA oslp+1
     :CMP ospointer+1
     :BNE notend
2020 LDA oslp
     :CMP ospointer
     :BEQ exit
2030 \
2040 \ If not at end of range add
      p2 (line number increment)
2050 \ to p1 to get next new line
2060 \
2070 .notend CLC
     :LDA p1+1
     :ADC p2+1
     :STA p1+1
2080 LDA p1
     :ADC p2
     :AND #&7F
     :STA p1
2090 JSR add \ adjust pointers to
      next line number
2100 JMP again \ and go back to again
2110 .exit
2120 \
2130 \ Now find next existing line
      number after end of renumber
      range
2140 \ If there isn t one then a
      dummy line number >32767
2150 \ will be returned by the &FF
      end of prog marker & next byte
2160 \ Store result in lnafterend
2170 \
2180 JSR add
     :LDY#0
     :LDA(oslp),Y
     :STA lnafterend
     :INY
     :LDA(oslp),Y
     :STA lnafterend+1
2190 \
2200 \ now check that the number
      in p1 (the last calculated
      new linenumber)
2210 \ is less than the number in
      lnafterend
2220 \ If not fall through to argerr2
      (clash error)
2230 \
2240 LDA lnafterend
     :CMP p1
     :BCC done
     :BNE done
     :LDA lnafterend+1
     :CMP p1+1
     :.done
     :BEQ argerr2
     :BCS cont
2250 .argerr2 LDY#4
     :.ov2 LDA mess2,Y
     :JSR oswrch
     :DEY
     :BPL ov2
     :JMP argerr
2260 \
2270 \ now repeat the renumber exactly
      as before, but this time
2280 \ actually change the line number
     s to their new values
2290 \
2300 .cont LDAp3
     :STAp1
     :LDAp3+1
     :STAp1+1
     :JSR findlin
2310 .again2 LDY#0
2320 LDAp1
     :STA (oslp),Y
2330 INY
     :LDAp1+1
     :STA (oslp),Y
2340 LDAoslp+1
     :CMPospointer+1
     :BNE notend2
2350 LDAoslp
     :CMPospointer
     :BEQ exit2
2360 .notend2 CLC
     :LDAp1+1
     :ADCp2+1
     :STA p1+1
2370 LDAp1
     :ADCp2
     :AND #&7F
     :STAp1
2380 JSR add
2390 JMP again2
2400 .exit2 LDA#13
     :STA buff \ clear input buffer
2410 \
2420 \ Now complete renumber process
      (eg deal with GOTO etc)
2430 \ using existing BASIC ROM routine
2440 \ Exit to relevent ROM...
2450 \
2460 BIT basic
```

→

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Renumber listing

From Page 178

```
     :BPL P%+5
     :JMP contren
     :JMP contren1 \ continue with
      process
2470 \
2480 \ Subroutines follow...
2490 \
2500 \ following routine finds line
      whose number is in p4, p4+1
2510 \ prevlin is initialised to
      point to first line number
2520 \ but after one pass through
      "addup"it points to the line
2530 \ previous to the one under
      consideration.
2540 \
2550 .findlin LDA page
     :STA oslp+1
     :STAprevlin+1
2560 LDX #1
     :STX oslp
     :STX prevlin
2570 .repeat LDY #00
     :LDA (oslp),Y
2580 BMI nolin \ end of prog. reached
      with no match
2590 INY
     :CMP p4
     :BCC addup \ if less than p4
      then try next line
2600 LDA (oslp),Y
     :CMP p4+1
     :BCC addup
2610 \
2620 \ now check if line equals "p4"
2630 \
2640 LDY #00
     :LDA (oslp),Y
     :INY
2650 CMP p4
     :BNE nomatch
2660 LDA (oslp),Y
     :CMP p4+1
2670 BNE nomatch
     :RTS \ return if line equals
      "p4"
2680 \
2690 \ if lnflag=1 then return: in
      this case the line number select
     ed
2700 \ will be the next existing
      number after that contained
      in p4
2710 \ If lnflag=0 then change oslp
      to point to the previous
2720 \ existing line to that contained
      in p4
2730 \ Also in this case INC lnflag
      so that it becomes 1
2740 \
2750 .nomatch LDAlnflag
     :CMP#0
     :BNE skipnomatch
2760 INClnflag
2770 LDAprevlin
     :STAoslp
     :LDAprevlin+1
     :STAoslp+1
2780 .skipnomatch RTS
2790 .addup JSR add \ move pointers
      to next line in program
2800 JMP repeat
2810 \
2820 \ Check lnflag; if 0 then branch
      to skipnolin, otherwise
2830 \ clear input buffer and jump
      to BASIC No Such Line error
2840 \ This latter course should
      only be invoked if an attempt
2850 \ is made to renumber a non-exist
     ent program
2860 \
2870 .nolin LDA#0
     :CMPlnflag
     :BEQ skipnolin
2880 BIT basic
     :BPL P%+5
     :JMP nolinerr
     :JMP nolinerr1 \ No line found
2890 \
2900 \ If lnflag=0 then change oslp
      to point to the final
2910 \ existing line in the program
     . INC lnflag and return
2920 \
2930 .skipnolin LDAfinalin
     :STAoslp
     :LDAfinalin+1
     :STAoslp+1
     :INClnflag
     :RTS
2940 \
2950 \ The following routine transfers
      the current line pointer in
      oslp
2960 \ to prevlin, and then adds
      the line offset to oslp so
      that it
2970 \ points to the next line number
      in the program
2980 \
2990 .add LDAoslp
     :STAprevlin
     :LDAoslp+1
     :STAprevlin+1
     :LDY#2
     :CLC
     :LDA (oslp),Y
3000 ADC oslp
     :STA oslp
3010 BCC noinc
     :INC oslp+1
3020 .noinc RTS
3030 \
3040 \ spskp increments Y to point
      to the next non-space
3050 \ character in buff
3060 \
3070 .spskp INY
     :LDA buff,Y
3080 CMP #&20 \ Is it a space
3090 BEQ spskp
     :RTS
3100 .mess
     :]
3110 REM mess points to Sign on message
3120 ?P%=13
     :P%=P%+1
     :$P%="detcennoc ytilitU"+
     CHR$ 12
3130 P%=P%+LEN ($P%)
     :data=P%
3140 REM data points to VERIFY
3150 $P%="VERIFY"
3160 P%=P%+LEN ($P%)
     :mess2=P%
3170 REM mess2 points to Clash
3180 $P%="hsalC"
3190 REM digits points to coded line
      number 32767
3200 P%=P%+LEN ($P%)+1
     :digits=P%
3210 !P%=&7F7F608D
     :P%=P%+4
3220 NEXT
3230 REM Now connect utility
3240 CALL connect
3250 REM machine-code saving informati
     on follows...
3260 PRINT '" *SAVE RENMC ";~connect-2
     ;" ";~P%;" ";~connect
3270 PRINT '"CALL &";~connect;" reconn
     ects after BREAK"
```

This listing is included in this month's cassette tape offer. See order form on Page 197.

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Big Letters listing

From Page 54

Listing 1

```
10 REM LISTING I
20 REM (c) Micro User 1984
30 OSWORD=&FFF1
40 OSWRCH=&FFEE
50 DIM save% 25
60 INPUT "Location - hex assumed"
   , location$
70 FOR pass%=0 TO 3 STEP 3
80 P% = EVAL ("&"+ location$)
90 [
100 OPT pass%
110 .width NOP
120 .depth NOP
130 .xstep NOP
140 .vstep NOP
150 .xpos NOP
   :NOP
160 .ypos NOP
   :NOP
170 .xstore NOP
   :NOP
180 .ystore NOP
   :NOP
190 .pattern NOP
200 ]
210 $P%="12345678"
220 P%=P%+8
230 [ OPT pass%
240 .start LDX # pattern MOD 256
250 LDY # pattern DIV 256
260 LDA # &0A
270 JSR OSWORD
280 LDA ypos
290 STA ystore
300 LDA ypos+1
310 STA ystore+1
320 LDY # 0
330 .outer_loop LDA xpos
340 STA xstore
350 LDA xpos+1
360 STA xstore+1
370 LDA pattern+1,Y
380 LDX # 0
390 .inner_loop ASL A
400 BCC noprint
410 PHA
420 TXA
   :PHA
430 TYA
   :PHA
440 JSR write
450 PLA
   :TYA
460 PLA
```

This listing was produced using a special formatter which breaks one program line over several lines of listing. When entering a line don't press Return until you come to the next line number. Full details of the formatter are in the July 1983 issue of The Micro User.

```
   :TXA
470 PLA
480 .noprint PHA
490 CLC
500 LDA xstore
510 ADC xstep
520 STA xstore
530 LDA xstore+1
540 ADC # 0
550 STA xstore+1
560 PLA
570 INX
580 CPX # 8
590 BNE inner loop
600 SEC
610 LDA ystore
620 SBC vstep
630 STA ystore
640 LDA ystore+1
650 SBC # 0
660 STA ystore+1
670 INY
680 CPY # 8
690 BNE outer_loop
700 CLC
710 LDA xstore
720 ADC xstep
730 STA xpos
740 LDA xstore+1
750 ADC #0
760 STA xpos+1
770 RTS
780 .write LDA # 5
790 JSR OSWRCH
800 LDA # &19
810 JSR OSWRCH
820 LDA # 4
830 JSR OSWRCH
840 LDA xstore
850 JSR OSWRCH
860 LDA xstore+1
870 JSR OSWRCH
880 LDA ystore
890 JSR OSWRCH
900 LDA ystore+1
910 JSR OSWRCH
920 LDA # &E0
930 JSR OSWRCH
940 LDA #4
950 JSR OSWRCH
```

```
960 RTS
970 .definer LDA # 23
980 JSR OSWRCH
990 LDA # &E0
1000 JSR OSWRCH
1010 LDA # 0
1020 LDX width
1030 .define_row SEC
1040 ROR A
1050 DEX
1060 BNE define_row
1070 LDY depth
1080 .send_rows JSR OSWRCH
1090 DEY
1100 BNE send_rows
1110 .send_blanks
1120 LDY # 8
1130 LDA # 0
1140 .blank JSR OSWRCH
1150 DEY
1160 BNE blank
1170 RTS
1180 ]
1190 NEXT pass%
1200 save$="SAVE FCODE "+location$+
     "+EA"
1210 $save%=save$
1220 X% = save% MOD 256
1230 Y% = save% DIV 256
1240 CALL &FFF7
```

Listing 2

```
10 REM LISTING II
20 REM MIKE BIBBY
30 REM (c) 1984
40 ON ERROR GOTO 650
50 VDU 23;8202;0;0;0;
60 1%=&900
70 CLS
   :toggle%=FALSE
```

→

Big Letters listing

From Page 183

```
    : finish%=FALSE
    : store%=@%
    : @%=3
 80 x%=1
    : y%=1
    : w%=1
    : d%=1
    :hold%=?(1%+&B8)
 90 INPUT TAB(0,10) "What Mode"
    ,mode%
100 PRINT TAB(0,14) "Special charact
    er? (Y/N)";
110 REPEAT
    : A$=GET$
    : UNTIL INSTR("YN",A$)
120 IF A$="Y"
    THEN PRINT TAB(0,18)"CHARACTER?"
    ;
    : A=GET
    : ?(1%+&B8)=A
    :x%=4
    : y%=4
    : w%=4
    : d%=4
130 MODE mode%
    : VDU 23;8202;0;0;0;
140 REPEAT
150 PROCf(x%,y%,w%,d%)
160 CLS
    : PROCw(0,824,"TEST")
170 *FX15,1
180 PRINT TAB(0,0)"  x  v  w  d
     "mode%
190 IF toggle%
    THEN t$="D"
    ELSE t$="I"
200 PRINT x%,y%,w%,d%,"   "t$
210 PROCkey
220 UNTIL finish%
230 @%=store%
    :?&9B8=hold%
240 PRINT "Again? (Y/N)";
250 REPEAT
    : A$=GET$
    : UNTIL INSTR("YN",A$)
260 IF A$="Y"
    THEN RUN
    ELSE END
270 END
280 REM =========================
290 DEF PROCkey
300 LOCAL key%,key$,increase%
310 increase%=2*SGN (toggle%)+1
320 REPEAT
330 key$=GET$
340 UNTIL INSTR("WDXYF"+CHR$ (13)
    ,key$)
350 key%=ASC (key$)
360 IF key%= 87
    THEN w%=w%+increase%
370 IF key%= 68
    THEN d%=d%+increase%
380 IF key%= 88
    THEN x%=x%+increase%
390 IF key%= 89
    THEN y%=y%+increase%
400 IF key%= 13
    THEN toggle%=NOT toggle%
410 IF key%= 70
    THEN finish%=TRUE
420 ENDPROC
430 REM =========================
440 DEF PROCw(x%,y%,w$)
450 LOCAL s%
460 !(1%+4)=x%
    :!(1%+6)=y%
470 FOR s%=1 TO LEN (w$)
480 ?(1%+&0C)=ASC (MID$(w$,s%,1))
490 CALL (1%+&15)
500 NEXT
510 ENDPROC
520 REM =========================
530 DEF PROCf(x%,y%,w%,d%)
540 LOCAL m%,f%
550 m%=?&355
560 IF m%=1 OR m%=4
    THEN f%=4
570 IF m%=2 OR m%=5
    THEN f%=8
580 IF m%=0
    THEN f%=2
590 x%=f%*x%
    : y%=y%*4
600 ?(1%+2)=x%
    : ?(1%+3)=y%
610 ?1%=w%
    :?(1%+1)=d%
620 CALL (1%+&C2)
630 ENDPROC
640 REM =========================
650 IF ERR =17
    THEN ?(1%+&B8)=hold%
    : RUN
660 REPORT
    : PRINT " at ";ERL
```

Listing 3

```
  5 REM LISTING III
 10 MODE 2
 20 PROCdefinefont(2,2,2,2)
 30 GCOL 0,5
 40 PROCwriteword(100,900,"Paul")
 50 PROCwriteword(350,600,"and")
 60 PROCwriteword(500,300,"Katie")
 80 GCOL 0,6
 90 PROCdefinefont(2,2,1,1)
100 PROCwriteword(100,900,"Paul")
110 PROCwriteword(500,300,"Katie")
200 END
210 DEF PROCwriteword(x%,y%,word$)
220 LOCAL 1%
230 !&904=x%
    :!&906=y%
240 FOR 1%=1 TO LEN (word$)
250 ?&90C=ASC (MID$(word$,1%,1))
260 CALL &915
270 NEXT
280 ENDPROC
290 DEF PROCdefinefont(xstep%,ystep%
    ,width%,depth%)
300 LOCAL mode%,factor%
310 mode%=?&355
    : REM BASIC II, OS1.2
320 IF mode%=1 OR mode%=4
    THEN factor%=4
330 IF mode%=2 OR mode%=5
    THEN factor%=8
340 IF mode%=0
    THEN factor%=2
350 xstep%=factor%*xstep%
    : ystep%=ystep%*4
360 ?&902=xstep%
    : ?&903=ystep%
370 ?&900=width%
    :?&901=depth%
380 CALL &9C2
390 ENDPROC
```

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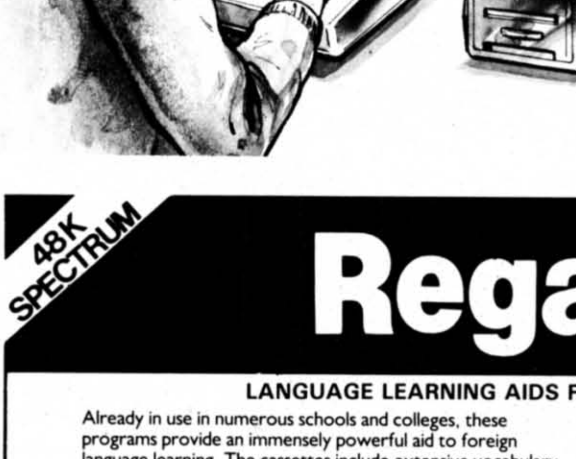

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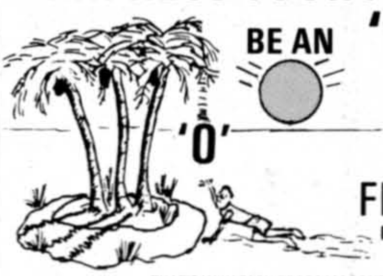

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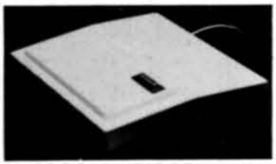

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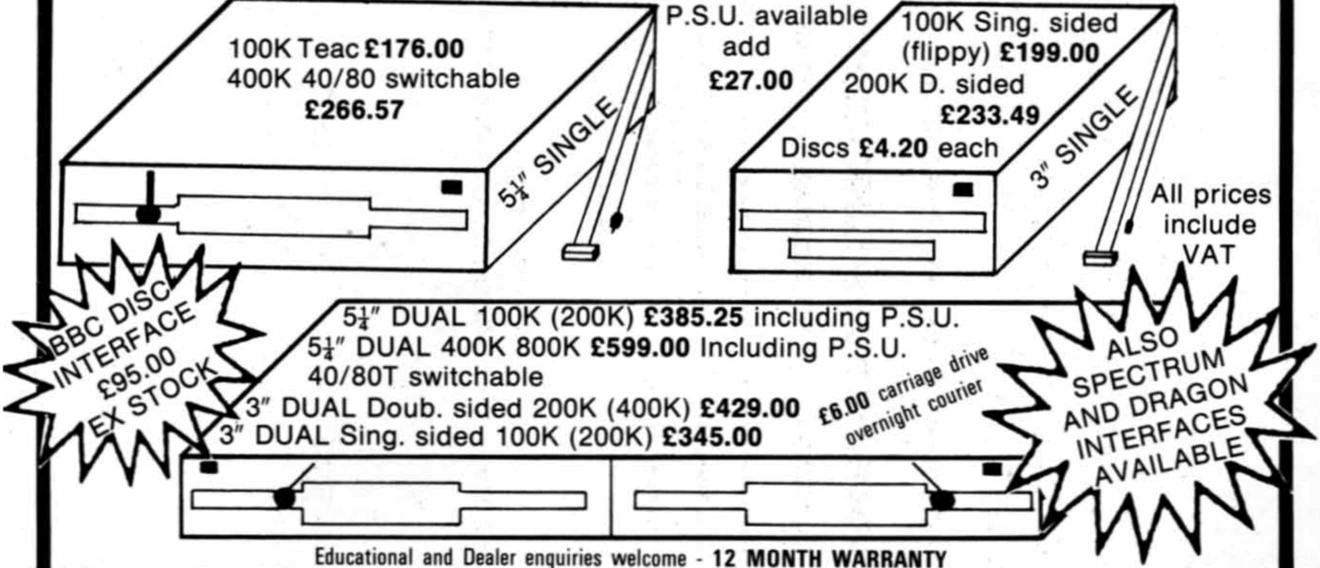
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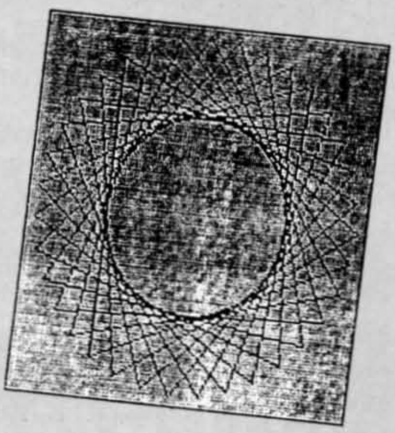
Spiro Two listing

From Page 131

This listing was produced using a special formatter which breaks one program line over several lines of listing. When entering a line don't press Return until you come to the next line number. Full details of the formatter are in the July 1983 issue of The Micro User.



```
 10 REM ** SpiroTwo **
 20 REM ** David Tall 1984 **
 30 MODE 1
 40 PROCinitial_values
 50 REPEAT
 60 PROCchoice
 70 IF Q<4
    THEN PROCwindows
 80 UNTIL Q=4
 90 END
100
110 DEF PROCinitial_values
120 DIM window(2),no(2),a(2),b(2)
    ,k(2),s$(2),place$(2)
130 no(1)=35
    :no(2)=80
    :s$(1)="t+11"
    :s$(2)="4*t"
140 place$(1)="below"
    :place$(2)="above"
150 a(1)=300
    :b(1)=300
    :a(2)=300
    :b(2)=300
160 VDU 19.2,4,0;0:
170 MOVE 644,386
    :DRAW 1276,386
    :DRAW 1276.1020
    :DRAW 644.1020
    :DRAW 644,386
180 MOVE 0,128
    :DRAW 632,128
    :DRAW 632.760
    :DRAW 0.760
    :DRAW 0,128
190 FOR N=1TO 2
    :PROCgraph(N)
    :CLG
    :NEXT
200 ENDPROC
210
220 DEF PROCchoice
230 PROCtext(3)
240 PRINT "Touch to draw:"
250 PRINT TAB(10);"1.in window 1"
260 PRINT TAB(10);"2.in window 2"
270 PRINT TAB(10);"3.in both
          4.end";
280 REPEAT
    :Q=INSTR("1234",GET$ )
    :UNTIL Q>0
    :CLS
290 IF Q<3
    THEN window(Q)=1
    :window(3-Q)=0
300 IF Q=3
    THEN window(1)=1
    :window(2)=1
310 ENDPROC
320
330 DEF PROCwindows
340 FOR N=1 TO 2
    :IF window(N)=1
    THEN PROCchange(N)
350 NEXT
360 max=0
    :IF window(1)=1
    THEN max=no(1)
370 IF window(2)=1 AND no(2)>max
    THEN max=no(2)
380 FOR N=1TO 2
    :IF window(N)=1
    THEN PROCgraph(N)
    :CLG
390 NEXT
400 FOR t=1 TO max
410 FOR N=1 TO 2
420 IF window(N)=1
    THEN PROCgraph(N)
    :MOVE a(N)*COS (k(N)*t),b(N)*
    SIN (k(N)*t)
    :s=EVAL s$(N)
    :DRAW a(N)*COS (k(N)*s),b(N)*
    SIN (k(N)*s)
430 NEXT
440 NEXT
450 ENDPROC
460
470 DEF PROCchange(N)
480 REPEAT
490 PROCnotation(N)
500 PRINT '"Touch N or R"'"to change
     or"'"SPACE to continue.";
510 REPEAT
    :Q=INSTR("nr ",CHR$ (GET
    OR 32))
    :UNTIL Q>0
520 IF Q=1
    THEN REPEAT
    :CLS
    :PRINT '''"Number"
    :INPUT "of points="no(N)
    :UNTIL no(N)>=1
530 IF Q=2
    THEN CLS
    :PRINT '''
    :INPUT "Rule  s="s$(N)
540 UNTIL Q=3
550 PROCnotation(N)
560 k(N)=2*PI /no(N)
570 ENDPROC
580
590 DEF PROCnotation(N)
600 PROCtext(N)
610 IF N=1PRINT ''''
620 COLOUR N
    :COLOUR 131
    :PRINT " Window ";N;" ";place$(N
    );" "
630 COLOUR 3
    :COLOUR 128
    :PRINT '"No. of points=";no(N)
640 PRINT "Rule:  s=";s$(N);
650 ENDPROC
660
670 DEF PROCgraph(N)
680 GCOL 0,128+N
690 VDU 29;0;0;
700 IF N=1
    THEN VDU 24,4;132;628;756;29
    ,316;446;
    ELSE IF N=2
    THEN VDU 24,648;390;1272;1016;29
    ,960;698;
710 ENDPROC
720
730 DEF PROCtext(N)
740 IF N=1
    THEN VDU 28,0,7,19,0
    ELSE IF N=2
    THEN VDU 28,21,27,39,20
    ELSE IF N=3
    THEN VDU 28,0,31,39,28
750 CLS
    :ENDPROC
```

This listing is included in this month's cassette tape offer. See order form on Page 197.

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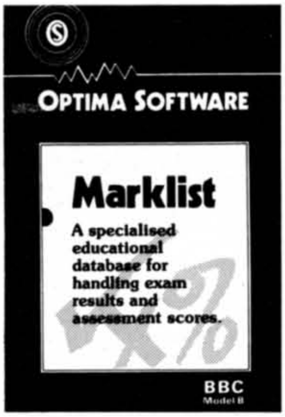
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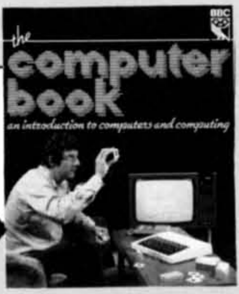
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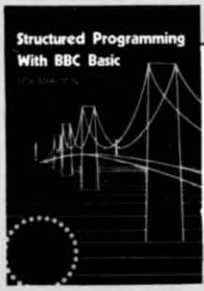
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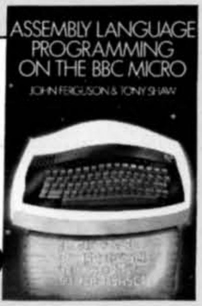
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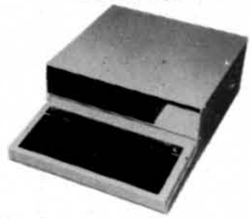

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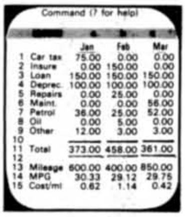

```
          Command (? for help)

               Jan     Feb     Mar
 1 Car tax    75.00    0.00    0.00
 2 Insure      0.00  150.00    0.00
 3 Loan      150.00  150.00  150.00
 4 Deprec.   100.00  100.00  100.00
 5 Repairs     0.00   25.00    0.00
 6 Maint.      0.00    0.00   56.00
 7 Petrol     36.00   25.00   52.00
 8 Oil         0.00    5.00    0.00
 9 Other      12.00    3.00    3.00
10
11 Total     373.00  458.00  361.00
12
13 Mileage   600.00  400.00  850.00
14 MPG        30.33   29.12   29.75
15 Cost/ml     0.62    1.14    0.42
```

The Contex Spreadsheet is one of the most versatile spreadsheet programs available for your BBC computer. It will process virtually any financial or statistical column/row analysis calculations you care to give it. Prepare your home and office budgets, process accounts, complicated invoices, job costing, small stock control operations, financial and statistical modelling, expense evaluations, foreign exchange etc.

Loaded into your 32K RAM means there is no ROM to install (which will save multiple machine installations a small fortune!). Hundreds now in use. Compare the spec. this revised, enhanced version gives you:

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Fast delivery. Discs supplied are 5¼" please specify if 40 or 80 track required.

CONTEX COMPUTING (B5)
15 Woodlands Close, Cople, Bedford MK44 3UE.

Dug Dig listing

From Page 118

```
    :Q%=0
    :PROCP(X%,Y%,0,MAN$)
230 REPEAT
    :PROCMOVE
    :FOR H%=0TO 2
    :PROCMONS
    :NEXT
    :UNTIL KRISTAL%=10OR KIL%=1
240 IF KIL%=1PROCDED
    :LIVES%=LIVES%-1
    :PROCMEN
    :IF LIVES%=0PROCEND
    :RUN
250 IF KRISTAL%=10CLS
    :VDU 19,1,RND(4);0;19,5,
    RND(4)+3;0;
    :GOTO 210
260 VDU 4,31,X%,Y%,32,30
    :M%(X%,Y%)=32
    :GOTO 220
270 DEF PROCMOVE
    :A%=INKEY (0)
    :*FX15,1
280 IF SP%=0REPEAT
    :Q%=RND(3)-2
    :P%=RND(3)-2
    :UNTIL ABS (Q%)<>ABS (P%)
    :GOTO 310
290 IF A%=32PROCPUMP
    :ENDPROC
300 P%=(A%=136)-(A%=137)
    :Q%=(A%=65)-(A%=90)
310 IF (Q%=0AND P%=0)OR X%+P%<0
    OR X%+P%>19OR Y%+Q%>30OR Y%+Q%<0ENDPROC
320 IF RND(1)<.1AND SP%=0PROCPUMP
    :ENDPROC
330 IF M%(X%+P%,Y%+Q%)=229AND CRY%=0
     M%(X%+P%,Y%+Q%)=32
    :CRY%=1
    :SC%=SC%+10
    :PROCSCORE
    :FOR D%=1TO 5
    :SOUND 1,-15*SP%,D%*50,1
    :NEXT
    ELSE IF M%(X%+P%,Y%+Q%)=229
    AND CRY%=1 ENDPROC
340 IF M%(X%+P%,Y%+Q%)=-1OR M%(X%
    ,Y%)=-1KIL%=1
350 IF CRY%=1AND M%(X%+P%,Y%+Q%)=226
    CRY%=0
    :SOUND 1,-15*SP%,125,1
    :KRISTAL%=KRISTAL%+1
    :SC%=SC%+50
    :PROCSCORE
    :ENDPROC
360 IF M%(X%+P%,Y%+Q%)=240OR M%(X%+P
    %,Y%+Q%)=226ENDPROC
370 IF M%(X%+P%,Y%+Q%)=255VDU 31
    ,X%+P%,Y%+Q%,32,30
    :M%(X%+P%,Y%+Q%)=32
380 SOUND 1,1,A%*SP%,2*SP%
    :PRINT TAB(X%,Y%);CHR$ 32;
    CHR$ 30
    :X%=X%+P%
    :Y%=Y%+Q%
    :OP%=P%
    :OQ%=Q%
    :PROCP(X%,Y%,0,MAN$)
    :ENDPROC
390 DEF PROCINIT
    :MAN$=CHR$ 18+CHR$ 0+CHR$ 7+
    CHR$ 224+CHR$ 18+CHR$ 0+
    CHR$ 4+CHR$ 8+CHR$ 225
    :MON$(0)=CHR$ 18+CHR$ 0+
    CHR$ 0+CHR$ 255+CHR$ 8+CHR$ 18+
    CHR$ 0+CHR$ 5+CHR$ 231+CHR$ 8+
    CHR$ 18+CHR$ 0+CHR$ 7+CHR$ 232
400 SHIP$=CHR$ 18+CHR$ 0+CHR$ 3+
    CHR$ 226+CHR$ 18+CHR$ 0+
    CHR$ 2+CHR$ 8+CHR$ 227+CHR$ 8+
    CHR$ 18+CHR$ 0+CHR$ 8+CHR$ 228
    :CRY$=CHR$ 18+CHR$ 0+CHR$ 13+
    CHR$ 229+CHR$ 18+CHR$ 0+
    CHR$ 10+CHR$ 8+CHR$ 230
    :ROK$=CHR$ 18+CHR$ 0+CHR$ 5+
    CHR$ 255+CHR$ 8+CHR$ 18+
    CHR$ 0+CHR$ 4+CHR$ 240
410 MON$(1)=CHR$ 18+CHR$ 0+CHR$ 0+
    CHR$ 255+CHR$ 8+CHR$ 18+
    CHR$ 0+CHR$ 6+CHR$ 237+CHR$ 8+
    CHR$ 18+CHR$ 0+CHR$ 7+CHR$ 238
    :MON$(2)=CHR$ 18+CHR$ 0+
    CHR$ 0+CHR$ 255+CHR$ 8+CHR$ 18+
    CHR$ 0+CHR$ 3+CHR$ 239+CHR$ 8+
    CHR$ 18+CHR$ 0+CHR$ 7+CHR$ 241
420 CRY%=0
    :OP%=0
    :OQ%=0
    :B$=CHR$ 18+CHR$ 0+CHR$ 5+
    CHR$ 255+CHR$ 8+CHR$ 18+
    CHR$ 0+CHR$ 1+CHR$ 254
    :SPLOT$=CHR$ 18+CHR$ 0+CHR$ 8+
    CHR$ 244+CHR$ 8+CHR$ 18+
    CHR$ 0+CHR$ 7+CHR$ 243
    :ENDPROC
430 DEF PROCSCREEN
    :FOR T%=0TO 100
    :GCOL 0,RND(4)+3
    :PLOT 69,RND(1280),RND(1024)
    :NEXT
    :PROCP(0,31,0,STRING$(20,B$))
    :FOR Z%=1TO 30
    :PROCP(9,Z%,0,SHIP$)
    :PRINT TAB(9,Z%-1);CHR$ 32
    :SOUND 1,-13*SP%,255-Z%*7,1
    :TIME =0
    :REPEAT UNTIL TIME >10
    :NEXT
    :SOUND 1,-15*SP%,0,10
    :SOUND 2,-15*SP%,0,10
440 SOUND 3,-15*SP%,0,10
    :X%=10
    :Y%=0
    :PROCP(X%,30,0,MAN$)
    :A=INKEY 30
    :SOUND 1,1,90*SP%,2*SP%
    :FOR T%=1TO 27
    :FOR H%=0TO 19
    :M%(H%,T%)=255
    :NEXT
    :COLOUR 5
    :COLOUR 129
    :PRINT TAB(0,31);STRING$(20
    ,CHR$ 254);CHR$ 30;
    :NEXT
    :COLOUR 128
    :SOUND 3,-15*SP%,T%*7,3
    :VDU 31,19,31,13,10
450 PRINT
    :FOR T%=0TO 19
    :M%(T%,31)=240
    :NEXT
460 FOR T%=27TO 30
    :PRINT TAB(0,T%);STRING$(20
    ,CHR$ 32);CHR$ 30;
    :FOR H%=0TO 19
    :M%(H%,T%)=32
    :NEXT
    :NEXT
    :PROCP(0,31,0,STRING$(20,ROK$))
470 FOR T%=0TO 30
    :A%=RND(15)
    :B%=RND(23)+5
    :FOR I%=0TO 1
    :FOR H%=0TO 2
    :PRINT TAB(A%+H%,B%+I%);
    CHR$ 32;
    :M%(A%+H%,B%+I%)=32
    :NEXT
    :NEXT
    :NEXT
    :M%(9,0)=226
    :FOR K%=0TO 2
    :M%(8+K%,1)=240
    :PROCP(8+K%,1,0,ROK$)
    :NEXT
480 FOR T%=0TO 9
    :A%=T%*2+1
    :B%=30
    :M%(A%,B%)=229
    :PRINT TAB(A%,B%);CHR$ 32;
```

→

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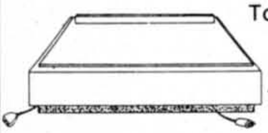
- Built-in block of four mains sockets complete with plugs to BS 5733
- Colour off-white suits monitor and micro.

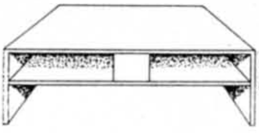
MODEL A. PVC wipe clean coating.



Top adjustable, flat or sloping, for best viewing position. Wires concealed with tails for computer and peripherals from all four sides.

MODEL B. As model 'A' but luxury vinyl covered.

MODEL C. Bridge disc unit. PVC wipe clean surface. Tailored for BBC micro and two slim disc drives.



- All models have mains distribution block and cable.

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BBCBASIC(Z80) will run on any computer using CP/M 2.2 or later and a Z80 processor. It comes complete with an instruction manual, a tutor on file handling and configuration notes.

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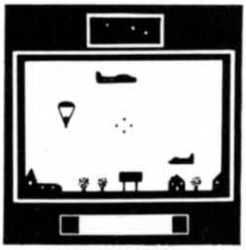

SCREEN DIAGRAM

You are sitting at the controls of the gun turret. You view the scenery via a camera on the gun barrel. Suddenly a blip appears on the radar. You swing the gun around to meet the blip – the scenery flashes by – the enemy plane bursts onto the large video screen, he is in the sights, squeeze the trigger – bullets scream out – the explosion is devastating. Your smile fades as two blips appear on the radar . . . . .

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COMPUTER SERVICES

7 OBRIDGE ROAD, TAUNTON,
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WARNING
Prolonged exposure to this program may result in severe addiction!!

Dug Dig listing

From Page 192

```
    CHR$ 30;
    :PROCP(A%,B%,0,CRY$)
    :NEXT
    :FOR H%=0TO 2
    :REPEAT MX%=RND(18)
    :MY%=RND(2)+26
    :UNTIL M%(MX%,MY%)<>229
    :PROCP(MX%,MY%,0,MON$(H%))
    :X%(H%)=MX%
    :Y%(H%)=MY%
    :M%(MX%,MY%)=-1
490 NEXT
    :PROCMEN
    :ENDPROC
500 DEF PROCP(x%,y%,c%,a$)
    :VDU 5,25,4,64*x%;(32-y%)*32-4;1
    8,0,c%
    :PRINT a$
    :VDU 4
    :ENDPROC
510 DEF PROCMONS
    :IF KIL%=1ENDPROC
520 IF X%=X%(H%)AND Y%=Y%(H%)KIL%=1
    :ENDPROC
530 MX%=X%(H%)
    :MY%=Y%(H%)
    :P1%=SGN (X%-MX%)
    :Q1%=SGN (Y%-MY%)
    :IF ABS (P1%)=1AND ABS (Q1%)=1
     Q1%=0
540 IF M%(MX%+P1%,MY%+Q1%)<>32P1%=
    RND(3)-2
    :Q1%=RND(3)-2
550 IF MX%+P1%<0OR MX%+P1%>19P1%=-P1%
560 IF MY%+Q1%<0OR MY%+Q1%>29Q1%=-Q1%
570 D%=M%(MX%+P1%,MY%+Q1%)
    :IF (D%=255AND RND(1)<.75)
    OR MY%+Q1%<=0OR D%=240OR D%=-1ENDPROC
580 VDU 31,MX%,MY%,32
    :M%(MX%,MY%)=32
    :MX%=MX%+P1%
    :MY%=MY%+Q1%
    :PROCP(MX%,MY%,0,MON$(H%))
    :M%(MX%,MY%)=-1
    :X%(H%)=MX%
    :Y%(H%)=MY%
    :ENDPROC
590 DEF PROCPUMP
    :IF (OP%=0AND OQ%=0)OR OP%+X%>19
    OR OP%+X%<0OR OQ%+Y%>31OR OQ%+Y%
    <0ENDPROC
600 IF M%(X%+OP%,Y%+OQ%)>32ENDPROC
610 IF M%(X%+OP%,Y%+OQ%)=-1GOTO
    630
620 FOR G%=233TO 236
    :PROCP(X%+OP%,Y%+OQ%,G%MOD 3+1
    ,CHR$ (G%))
    :FOR K%=0TO 300
    :NEXT
    :SOUND 0,-(G%-221)*SP%,4,2
    :NEXT
    :VDU 31,X%+OP%,Y%+OQ%,32
    :ENDPROC
630 V%=-1
    :J%=-1
    :REPEAT
    :J%=J%+1
    :IF X%(J%)=X%+OP%AND Y%(J%)=Y%+O
    Q%V%=J%
640 UNTIL J%=2OR V%<>-1
    :M%(X%+OP%,Y%+OQ%)=32
    :IF V%=-1ENDPROC
650 FOR H%=0TO 10
    :PROCP(X%+OP%,Y%+OQ%,0,MON$(V%))
    :SOUND 1,-15*SP%,255-H%*2,1
    :VDU 31,X%+OP%,Y%+OQ%,32
    :NEXT
    :PROCP(X%+OP%,Y%+OQ%,0,SPLOT$)
    :SOUND 0,2,5*SP%,10*SP%
    :SOUND 0,2,6*SP%,1*SP%
    :SC%=SC%+20
    :FOR KK=0TO 400
    :NEXT
    :VDU 31,X%+OP%,Y%+OQ%,32
660 PROCSCORE
    :REPEAT
    :A%=RND(18)
    :B%=RND(20)+7
    :UNTIL M%(A%,B%)=32
    :X%(V%)=A%
    :Y%(V%)=B%
    :PROCP(A%,B%,0,MON$(V%))
    :ENDPROC
670 DEF PROCDED
    :SOUND 3,3,119*SP%,45*SP%
    :COLOUR 8
    :PRINT TAB(X%,Y%);CHR$ 242;
    :FOR KK=0TO 4000
    :NEXT
    :PRINT TAB(X%,Y%);CHR$ 32;
    :IF CRY%=0ENDPROC
680 CRY%=0
    :D%=0
    :REPEAT
    :IF M%(D%*2+1,30)=32
    THEN M%(D%*2+1,30)=229
    :PROCP(D%*2+1,30,0,CRY$)
    :D%=9
690 D%=D%+1
    :UNTIL D%>=10
    :ENDPROC
700 DEF PROCEND
    :PROCMEN
    :VDU 17,8,31,5,15
    :PRINT "GAME OVER"
    :FOR KK=0TO 10000
    :NEXT
    :IF SC%>C% C%=SC%
    :ENDPROC
    ELSE ENDPROC
710 DEF PROCSCORE
    :VDU 17,132,17,9,31,0,31
    :PRINT "1UP=";CHR$ 17;CHR$ 3;SC%
    ;CHR$ 17;CHR$ 9;
    :VDU 30,31,12,31
    :PRINT "HI=";CHR$ 17;CHR$ 3;C%;
    :VDU 30,17,128,17,0,0
    :ENDPROC
720 DEF PROCMEN
    :M%(0,0)=240
    :M%(1,0)=240
    :M%(2,0)=240
    :VDU 31,0,0,32,32,32
    :IF LIVES%<2ENDPROC
    ELSE PROCP(0,0,0,STRING$(LIVES%-
    1,MAN$))
    :ENDPROC
770 PROCSOUND
    :VDU 17,15,31,0,30
    :TIME =0
    :PRINT "Press SPACE to play";
    :REPEAT UNTIL INKEY 0=32
    OR TIME >1500
    :CLS
    :IF TIME >1500SP%=0
    ELSE SP%=1
780 ENDPROC
790 DEF PROCSOUND
    :RESTORE 800
    :FOR T%=0TO 4
    :READ KK,ZZ
    :SOUND 1,-15,KK,ZZ
    :SOUND 2,-15,KK+48,ZZ
    :NEXT
    :COLOUR 1
    :FOR T=0TO 3000
    :NEXT
    :ENDPROC
800 DATA 45,15,49,5,53,5,41,15
    ,68,30
810 *FX12,0
820 IF ERR =17RUN
830 REPORT
    :PRINT " at line ";ERL
840 *FX4,0
```

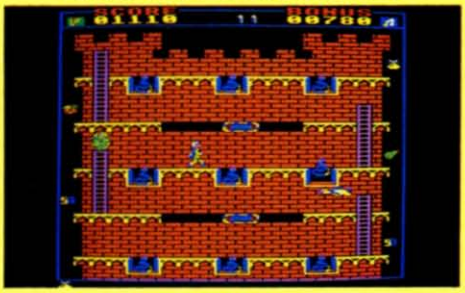
This listing is included in this month's cassette tape offer. See order form on Page 197.

All games for BBC Micro 32K OS 1.2 only

MRM SOFTWARE

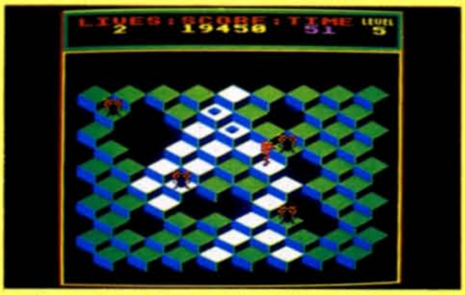
NEW RELEASES

CASTLE ASSAULT



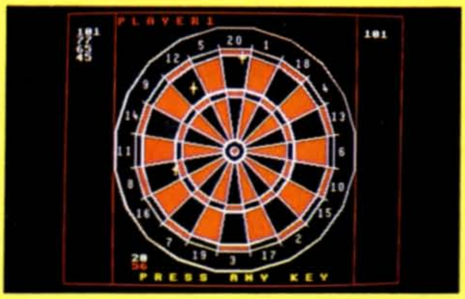
A glittering reward awaits the intrepid atop the heavily defended towering turrets of this forbidding fortress. On your quest for gold you will be assailed by a menacing menagerie of meanies, namely crabs, snakes, lobsters, spiders, bugs and beetles. Watch out for those malicious malades (the deadly Flying Ducks) as you dodge falling rocks, scale ladders and negotiate moving platforms. Collect various different fruits for bonus points on your way. Bonus man for every two bags of gold collected. Hi-score table, increasing difficulty and fantastic animation constitute this stunning game from MRM.

SCREWBALL



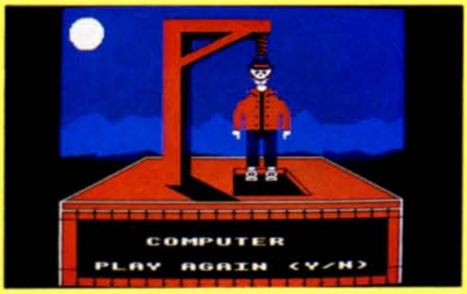
You are Screwball and you have 60 seconds to change the colour of all the squares that surround you (by simply jumping on them).
Menacing you all the time, however, are the 'BLACK BUGS' . . . and they sure are mean. They even cheat by sometimes not even walking on the squares.
If they catch you then I am afraid you lose a life. Kill the BUGS by digging holes for them to fall through. If you really are in a fix then as a last resort you may HYPERSPACE to the top of the grid . . . but you won't always survive the journey.

DARTS



Step up to the ocky and enjoy all the fun of competition darts with this high resolution version by MRM. A choice of 3 popular dart games, 501, Round the Board and Cricket is available in this package.

HANGMAN/SOLITAIRE



This great value two game package consists of a multi menu hi-resolution graphics version of Hangman (including a special category for children) with a colourful 3D version of Solitaire.

MRM SOFTWARE

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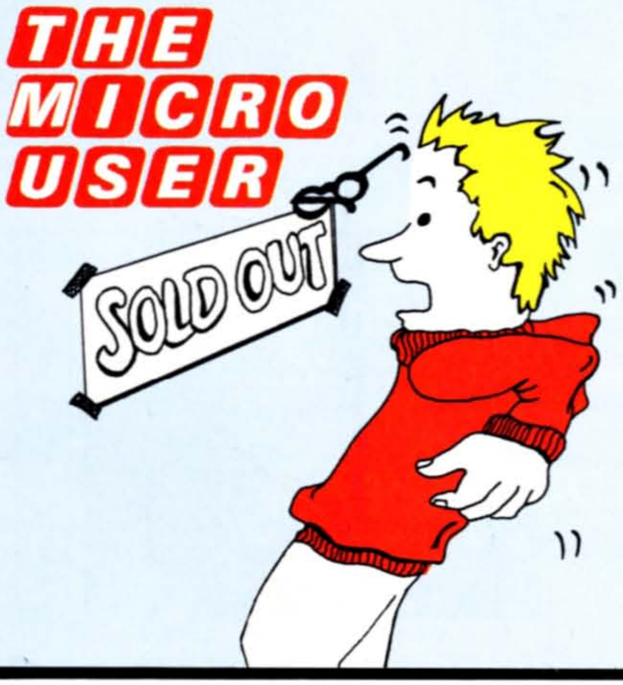

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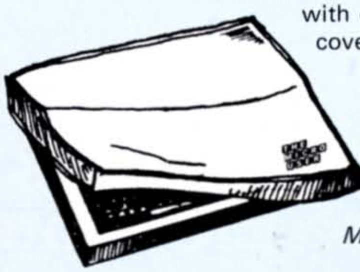

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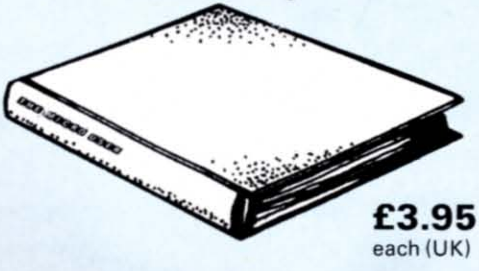

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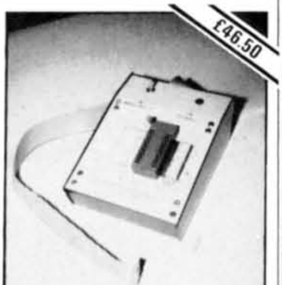

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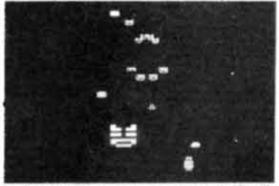

Actual screen photograph of 'Devil Swarm', a demo. game

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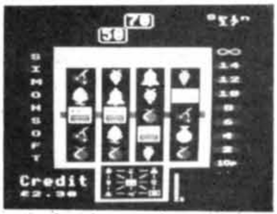

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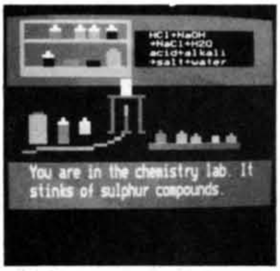

HCl+NaOH
+NaCl+H2O
acid+alkali
+salt+water

You are in the chemistry lab. It stinks of sulphur compounds.

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Damraiders listing

From Page 83

```
680 PRINT
    :PRINT
690 PRINT "SCORE 50 POINTS FOR EACH
     PLANE"
700 PRINT
710 PRINT "SCORE 100 POINTS FOR EACH
     SUBMARINE"
720 PRINT
730 PRINT "10 BONUS POINTS ARE SCORED
     FOR EACH"
740 PRINT "BRICK LEFT IN THE DAM
     AT THE END"
750 PRINT
    :PRINT
760 PRINT "PRESS SPACE BAR"
770 REPEAT UNTIL INKEY (-99)
780 REPEAT UNTIL NOT INKEY (-99)
790 CLS
800 PRINT CHR$ (141);TAB(13,0);"CONTR
    OLS"
810 PRINT CHR$ (141);TAB(13,1);"CONTR
    OLS"
820 PRINT
830 PRINT " Z              move ship
     LEFT"
840 PRINT " X              move ship
     RIGHT"
850 PRINT
860 PRINT "SPACE BAR      fire missile
    "
870 PRINT
880 PRINT " <              guide missil
    e LEFT"
890 PRINT " >              guide missil
    e RIGHT"
900 PRINT
910 PRINT "f0 to f9       release
     depth charge"
920 PRINT "                to explode
     at "
930 PRINT "                preset depth
    ."
940 PRINT "                f0 is minimu
    m depth"
950 PRINT "                f9 is maximu
    m depth"
960 PRINT
    :PRINT
    :PRINT :
970 PRINT "PRESS SPACE BAR"
980 REPEAT UNTIL INKEY (-99)
990 REPEAT UNTIL NOT INKEY (-99)
1000 ENDPROC
1010 DEF PROCinitialise
1020 VDU 23,255,255,255,255,255,255
     ,255,255,255
1030 VDU 23,224,0,126,126,126,126
     ,126,126,0
1040 VDU 23,225,255,129,129,129,129
     ,129,129,255
1050 VDU 23,226,0,0,0,0,255,255,255
     ,127
1060 VDU 23,227,1,7,31,255,255,255
     ,255,255
1070 VDU 23,228,0,0,0,128,255,254
     ,252,248
1080 VDU 23,230,1,1,1,0,0,0,0,0
1090 VDU 23,231,0,0,0,128,1,2,4,8
1100 VDU 23,232,0,0,0,0,128,128,128
     ,64
1110 VDU 23,233,1,4,16,128,0,0,0
     ,0
1120 VDU 23,235,130,134,204,254,255
     ,24,48,32
1130 VDU 23,236,130,134,204,192,192
     ,24,48,32
1140 VDU 23,237,1,1,1,1,127,255,255
     ,127
1150 VDU 23,238,192,192,192,192,254
     ,255,255,254
1160 VDU 23,239,1,1,1,1,64,128,128
     ,64
1170 VDU 23,240,64,64,64,64,2,1,1
     ,2
1180 VDU 23,241,0,0,0,0,255,0,0,0
1190 VDU 23,242,1,6,24,224,0,0,0
     ,0
1200 VDU 23,243,0,0,0,128,127,0,0
     ,0
1210 VDU 23,244,130,4,72,50,1,0,32
     ,0
1220 M%=0
     :P%=0
     :B%=0
     :H%=0
     :T%=0
     :U%=0
     :D%=0
1230 DP%=0
     :SX%=500
1240 PX%=0
     :PY%=0
1250 BX%=0
     :BY%=-4
1260 UX%=0
     :UY%=0
1270 TX%=0
     :TY%=0
1280 DX%=0
     :DY%=0
1290 SL%=511
     :NL%=511
     :BL%=543
     :DM%=0
1300 SC%=0
     :BN%=760
1310 ENVELOPE 1,0,0,0,0,0,0,0,25
     ,-5,0,-1,126,2
1320 ENVELOPE 2,3,0,3,0,0,1,0,25
     ,-15,0,-12,126,25
1330 ENVELOPE 3,3,0,0,0,0,0,0,120
     ,-10,0,-12,126,10
1340 ENVELOPE 4,15,0,0,0,0,0,0,120
     ,-15,0,-12,126,10
1350 ENVELOPE 5,3,10,8,6,5,2,1,36
     ,-6,0,-35,70,25
1360 ENDPROC
1370 DEF PROCscreen
1380 FOR C=1 TO 7
1390 VDU 19,C,0,0,0,0,0
1400 NEXT
1410 VDU 24,0;SL%;1279;1023;
1420 GCOL 0,134
     :CLG
1430 VDU 24,0;0;1279;SL%;
1440 GCOL 0,132
     :CLG
1450 VDU 26
1460 VDU 5
1470 PROCscore(0)
1480 Y%=543
1490 REPEAT
1500 MOVE 1024,Y%
1510 GCOL 0,1
1520 VDU 224,224,224,224
1530 MOVE 1024,Y%
1540 GCOL 0,7
1550 VDU 225,225,225,225
1560 Y%=Y%-32
1570 UNTIL Y%<0
1580 MOVE SX%,SL%+32
1590 GCOL 0,5
     :VDU 226,227,228
1600 VDU 20
1610 ENDPROC
1620 DEF PROCmainloop
1630 PROCmoveboat
     :PROCmissile
     :PROCplanes
     :PROCbomb
     :PROCsea
     :PROCsub
     :PROCtorpedo
     :PROCdepth
     :PROCsea
1640 VDU 20
1650 ENDPROC
1660 DEF PROCmoveboat
1670 IF INKEY (-98) AND SX%>0
     THEN PROCleft
```

→

Damraiders listing

From Page 201

```
1680 IF INKEY (-67) AND SX%<836
     THEN PROCright
1690 ENDPROC
1700 DEF PROCleft
     :GCOL 0,6
     :MOVE SX%,SL%+32
     :VDU 32,230,231
     :SX%=SX%-8
     :GCOL 0,5
     :MOVE SX%,SL%+32
     :VDU 226,227,228
     :ENDPROC
1710 DEF PROCright
     :GCOL 0,6
     :MOVE SX%,SL%+32
     :VDU 232,233
     :SX%=SX%+8
     :GCOL 0,5
     :MOVE SX%,SL%+32
     :VDU 226,227,228
     :ENDPROC
1720 DEF PROCmissile
1730 IF M%=0 AND INKEY (-99)
     THEN MX%=SX%+152
     :MY%=SL%+32
     :M%=1
     :SOUND 0,2,57,24
1740 IF M%=0 ENDPROC
1750 GCOL 0,6
     :PLOT 69,MX%,MY%
1760 IF INKEY (-103) MX%=MX%-8
1770 IF INKEY (-104) MX%=MX%+8
1780 MY%=MY%+8
     :IF POINT(MX%,MY%)=0
     THEN PROChit
     :PROCscore(50)
     :ENDPROC
1790 GCOL 0,1
     :PLOT 69,MX%,MY%
     :IF MY%>1023
     THEN M%=0
1800 ENDPROC
1810 DEF PROCplanes
1820 IF P%=0
     THEN PX%=-32
     :PY%=RND(8)*32+BL%+64
     :P%=1
     :IF BL%-SL%>64
     THEN PY%=BL%+64
1830 GCOL 0,6
     :MOVE PX%,PY%
     :VDU 236
     :GCOL 0,0
     :PX%=PX%+16
     :MOVE PX%,PY%
     :VDU 235
1840 IF PX%<896-(2*(PY%-BL%+32))
      ENDPROC
1850 IF PY%=BL%+64
     THEN 1870
1860 GCOL 0,6
     :MOVE PX%,PY%
     :VDU 244
     :GCOL 0,0
     :PY%=PY%-4
     :MOVE PX%,PY%
     :VDU 235
1870 IF PX%>1343
     THEN P%=0
1880 ENDPROC
1890 DEF PROChit
     :SOUND 0,4,21,17
     :P%=0
     :M%=0
     :PX=-32
     :MOVE PX%,PY%
     :GCOL 0,6
     :VDU 255
     :ENDPROC
1900 DEF PROCbomb
1910 IF B%=0 AND (ABS ((SX%+96)-PX%)<3
     2 OR (PX%>1024+DM% AND PX%<1024+D
     M%+32)) BX%=PX%+16
     :BY%=PY%-32
     :B%=1
1920 IF BY%>SL% GCOL 0,6
     ELSE GCOL 0,4
1930 PLOT 69,BX%,BY%
     :GCOL 0,1
     :BY%=BY%-8
1940 IF BX%<1024 AND BY%<=SL% B%=0
     :BX%=0
     :BY%=-4
     :ENDPROC
1950 IF BX%>1279
     THEN BX%=0
     :BY%=-4
     :B%=0
     :ENDPROC
1960 IF BY%<0 B%=0
     :BX%=0
     :DM%=DM%+64
     :ENDPROC
1970 IF POINT(BX%,BY%)=1 OR POINT(BX%
     ,BY%)=7 PROCbrick(BX%DIV 64*64
     ,BY%)
     :B%=0
     :BX%=0
     :BY%=-4
     :DM%=DM%+64
1980 IF DM%=256
     THEN DM%=0
     :BL%=BL%-32
1990 IF POINT(BX%,BY%)=5 PROCship
2000 PLOT 69,BX%,BY%
2010 ENDPROC
2020 DEF PROCbrick(RX%,RY%)
2030 BN%=BN%-10
     :IF BN%<0 BN%=0
2040 SOUND 0,3,20,10
     :MOVE RX%,RY%
     :IF RY%>SL% GCOL 0,6
     ELSE GCOL 0,4
2050 VDU 255
     :IF POINT(1056,RY%)=4 AND
     POINT(1120,RY%)=4 AND POINT(1184
     ,RY%)=4 AND POINT(1248,RY%)=4

     THEN NL%=RY%-32
2060 ENDPROC
2070 DEF PROCship
     :VDU 19,5,1,0,0,0,0
     :SOUND 0,4,21,17
     :B%=0
     :BX%=0
     :BY%=-4
     :H%=H%+1
     :ENDPROC
2080 DEF PROCsub
2090 IF U%=0 AND NL%DIV 4=SL%DIV 4

     THEN UX%=-32
     :UY%=RND(SL%DIV 32)*32-4
     :D%=8
     :U%=1
     :IF SL%=31
     THEN UY%=31
2100 GCOL 0,2
     :MOVE UX%,UY%
     :VDU 237,238
     :GCOL 0,4
2110 IF D%=8 MOVE UX%,UY%
     :VDU 239
2120 IF D%=-8 MOVE UX%+64,UY%
     :VDU 240
2130 GCOL 0,2
     :UX%=UX%+D%
     :MOVE UX%,UY%
     :VDU 237,238
2140 IF D%=8 AND UX%>RND(SL%)+400

     THEN D%=0
2150 IF UX%<-300
     THEN U%=0
2160 ENDPROC
2170 DEF PROCtorpedo
2180 IF T%=0 AND D%=0 TX%=UX%+128
     :TY%=UY%-16
     :T%=1
     :D%=-8
```

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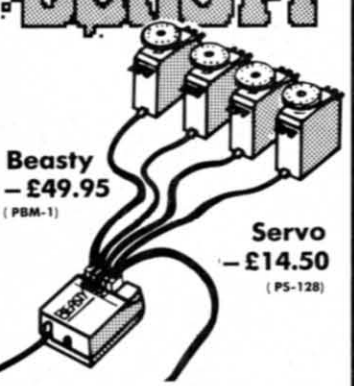

Beasty – £49.95
(PBM-1)

Servo – £14.50
(PS-128)

Servos:
FROM – 1-4 servos, 3.5kg/cms
60 degrees in 0.25 secs, 100 degrees range.

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And you can start with the whole kit – the beasty, beasty arm and four servos, and the vision system. Or, if you're feeling a little nervous about controlling all this new-found power, your computer can be given its freedom with as little as one beasty and one servo.

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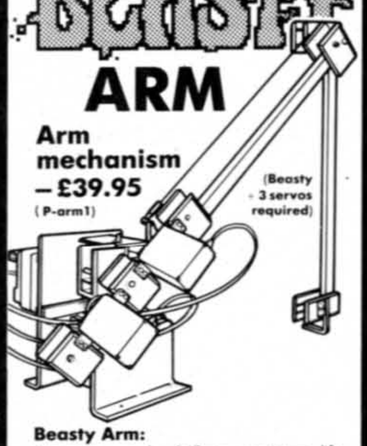
THE BEASTY ARM



Arm mechanism – £39.95
(P-arm1)

(Beasty + 3 servos required)

Beasty Arm:
Maximum reach: 340mm, maximum lift: 400mm, maximum load: 75gms, point to point time: less than 0.5 secs.

SNAP:
Resolution up to 256×128, up to 20 frames/second, up to 8 grey levels. **SNAP – £99.95** (P-Snap1)

Why not learn Basic the Micro User way?

IN July Mike Bibby will be running a weekend course in BBC Basic for absolute beginners at the University of Manchester's prestigious Holly Royde College.

Followers of Mike's Beginners articles in *The Micro User* will already be familiar with his clear, easy-to-follow style of teaching. Mike has also had considerable success as a lecturer on beginners' Basic courses for the Extra-Mural department of the University.

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Holly Royde College is in South Manchester within easy reach of the M56 and M63. It provides an ideal environment, with excellent accommodation and a warm and hospitable atmosphere. All meals and equipment will be provided for the course, which starts with dinner at 6.45pm on Friday, July 6 and finishes with tea at 4pm on Sunday July 8.

In order to ensure personal attention the number of places is strictly limited, so early booking is advisable. If you wish to attend, please send the course fee of £125 (inc VAT), made out to Database Publications.

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**Send to: Basic Course, Europa House,
68 Chester Road, Hazel Grove,
Stockport SK7 5NY.**

Damraiders listing

From Page 202

```
2190 GCOL 0,4
     :PLOT 69,TX%,TY%
     :GCOL 0,3
     :TX%=TX%+16:
2200 IF POINT(TX%,TY%)=1 PROCbrick(TX%
     DIV 64*64,TY%+16)
     :T%=0
     :TX%=0
     :TY%=0
2210 IF T%=1 PLOT 69,TX%,TY%
2220 IF TX%>1279 T%=0
2230 ENDPROC
2240 DEF PROCdepth
2250 IF DP%<>0 GOTO 2320
2260 FOR I%=10 TO 1 STEP -1
     :READ D%(I%)
2270 IF INKEY (D%(I%))
     THEN EX%=I%
     :DP%=1
     :DX%=SX%
     :DY%=SL%+20
     :SOUND 0,1,28,6
2280 NEXT
2290 DATA -33,-114,-115,-116,-21
     ,-117,-118,-23,-119,-120
2300 RESTORE
2310 IF DP%=0 ENDPROC
2320 IF DY%<SL% GCOL 0,4
     ELSE GCOL 0,6
2330 PLOT 69,DX%,DY%
2340 IF DP%=1
     THEN DX%=DX%-8
     :DY%=DY%+8
2350 IF DY%>SL%+64
     THEN DP%=2
2360 IF DP%=2
     THEN DY%=DY%-8
2370 IF POINT(DX%,DY%)=2 PROCexplode
     :ENDPROC
2380 GCOL 0,7
     :PLOT 69,DX%,DY%
2390 IF DY%<(SL%DIV 10*EX%)-16
     PROCexplode
2400 IF DY%<8 PROCexplode
2410 IF DY%=0
     :DP%=0
2420 ENDPROC
2430 DEF PROCexplode
     :SOUND 0,4,21,10
     :DP%=0
     :EX%=0
2440 FOR E%=1 TO 5
     :MOVE DX%,DY%
     :GCOL 0,RND(7)
     :PLOT 1,RND(28),RND(12)
     :NEXT
2450 MOVE DX%-8,DY%+16
     :GCOL 0,4
     :VDU 255
2460 IF ABS (DY%-UY%)<64 AND ABS (DX%-
     (UX%+64))<96
     THEN MOVE UX%,UY%
     :GCOL 0,4
     :VDU 255,255
     :UX%=0
     :UY%=0
     :U%=0
     :PROCscore(100)
2470 ENDPROC
2480 DEF PROCscore(S%)
     :SC%=SC%+S%
     :VDU 4
     :COLOUR 134
     :PRINT TAB(0,0);"SCORE",SC%
     :VDU 5
     :ENDPROC
2490 DEF PROCsea
2500 IF SL%DIV 4=NL%DIV 4
     THEN ENDPROC
2510 D%=-8
2520 IF SL%-UY% <32 REPEAT
     :PROCsub
     :UNTIL UX%<-128
2530 GCOL 0,6
     :SOUND 1,5,12,5
     :MOVE 0,SL%
     :DRAW 1023,SL%
2540 IF POINT(1055,SL%)=4 DRAW 1087
     ,SL%
2550 IF POINT(1119,SL%)=4 DRAW 1151
     ,SL%
2560 IF POINT(1183,SL%)=4 DRAW 1215
     ,SL%
2570 IF POINT(1247,SL%)=4 DRAW 1279
     ,SL%
2580 MOVE SX%,SL%+32
     :GCOL 0,6
     :VDU 241,242,243
     :SL%=SL%-4
     :MOVE SX%,SL%+32
     :GCOL 0,5
     :VDU 226,227,228
     :IF SL%<=4
     THEN H%=3
2590 ENDPROC
2600 DEF PROCend
     :SOUND 0,4,21,10
     :FOR E%=1 TO 50
     :VDU 19,RND(7),RND(7),0,0,0
     ,0
     :FOR D=1 TO 20
     :NEXT
     :NEXT
     :VDU 20
2610 MOVE SX%,SL%+32
     :GCOL 0,6
     :VDU 255,255,255
     :GCOL 0,0
     :FOR I=1 TO 20
     :PLOT 69,RND(320)+SX%-64,
     RND(96)+SL%
     :NEXT
2620 MOVE 320,700
     :GCOL 0,1
     :PRINT "GAME OVER"
     :SOUND 0,4,21,100
2630 TIME =0
     :REPEAT UNTIL TIME >500
2640 ENDPROC
2650 DEF PROChighscore
2660 FOR I=5 TO 1 STEP -1
2670 IF SC%+BN% >H%(I)
     THEN H%(I+1)=H%(I)
     :H%(I)=SC%+BN%
     :N$(I+1)=N$(I)
     :N$(I)=N$
2680 NEXT
2690 CLS
2700 PRINT TAB(5,5)"DAMRAIDER HIGH
      SCORES"
2710 PRINT
2720 PRINT "ADMIRAL      ";N$(1)
     ,H%(1)
2730 PRINT "CAPTAIN      ";N$(2)
     ,H%(2)
2740 PRINT "L'TENANT     ";N$(3)
     ,H%(3)
2750 PRINT "COXSWAIN     ";N$(4)
     ,H%(4)
2760 PRINT "ABLE S'MAN   ";N$(5)
     ,H%(5)
2770 PRINT
     :PRINT
     :PRINT :
2780 PRINT "PRESS SPACE BAR FOR NEW
      GAME"
2790 REPEAT UNTIL INKEY (-99)
2800 REPEAT UNTIL NOT INKEY (-99)
2810 ENDPROC
2820 REM ERRORS
2830 MODE 7
2840 REPORT
2850 PRINT " at line ";ERL
2860 END
```

This listing is included in this month's cassette tape offer. See order form on Page 197.

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Large picture shows BBC Computer System and a Quickshot II Joystick. Small inset just a few of the joysticks that will work with the patch lead. Screenshot by kind permission of SUPERIOR SOFTWARE

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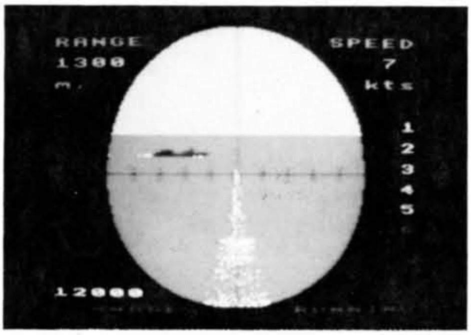

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The answer's simple . . .

LISTINGS!

Pages and pages of them. Games, graphics, utilities – plus regular features like Casting Agency and Sounds Exciting – all clearly defined to ensure you key in correctly first time.

ALL Electron User listings have been written so that they will also work without modification on a BBC Micro with OS 1.2 and Basic II.

If you have OS 1.2 with Basic I you may have to substitute certain semi-colons for commas. And if you have OS 1.0 or 0.1, you will find nearly all the programs will run without modification.

In the May issue you'll find action games, arcade classics, logic games – in fact, all sorts of games. Your Electron becomes a rally car, a fruit machine, a mental arithmetic test and an electronic drawing board in turn. There's also noughts and crosses, a pursuit game and a secret message encoder. With articles on graphics and beginners Basic, computer number systems and the difference between ROM and RAM, it's the biggest and best Electron User yet.

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Grapevine is simply the most versatile modem available, at the price, for home or business use. It offers Viewdata/Prestel baud rates (1200/75) alongside 300/300 baud full duplex for communication between the BBC and other computers.

Grapevine offers both European and Bell frequencies for compatability with American Databases and standard European CCITT systems.

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Grapevine utilises RS232/RS423 interface standards with a 5 pin domino din connector. It is supplied complete with the appropriate lead for connection to the BBC micro, other leads are available on request.

The BBC microcomputer requires communications software to operate Grapevine. This is provided by Commstar, the intelligent communications eprom from Pace. Commstar is extremely flexible and provides numerous commands to transmit, receive, save, load or transfer data. By using Commstar it is possible to access Prestel, Micronet, Homelink, Telecom Gold, and various 'Bulletin Boards' throughout the country. Commstar can be used to emulate other terminals simply, (e.g. VT 100), by means of a configuration disc.

The complete Grapevine/Commstar package, for the BBC which includes the Modem eprom, all cables and manual is just £139 plus VAT.

Please telephone for a comprehensive fact sheet.

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This modem incorporates the very latest in communication technology and is therefore not yet B.A.B.T. approved.

Case for puzzles for programmers

I REALLY must congratulate you and Mike Bibby for the excellent series "Introduction to Programming".

I find the clear, step by step instructions are just right for a novice like myself to understand.

While I doubt I will ever become an expert programmer you have no idea how much pleasure I get when I have successfully solved one of the problems posed at the end of each article.

I am sure other readers must feel the same and I am prompted to ask whether you could include a page (or half a page) of programming puzzles in future issues of The Micro User.

Perhaps, if the questions ranged from very easy to very hard, it would cater for all levels of programming abilities. – **D. Marchington, Guiseley, Leeds.**

● Thanks a lot for the praise. Your idea of a regular page of programming puzzles is a great suggestion.

There must be lots of computer teachers who have their own pet puzzles and exercises.

So how about it? Why not send in the programs you've used to illustrate your lessons with – then we can share them with everyone?

Incidentally, send the answers too. The editorial staff of The Micro User are not as young as they used to be.

Clock interrupt

REGARDING Michael Pastore's letter in the February 1984 issue of The Micro User, there is a way of programming one of the BBC's internal clocks to produce an interrupt – the interval timer.

Using an OSWORD call with A=4 you can set the timer to a value (see page 460 of the User Guide). It will then increment every hundredth of a second and will cause an event (if you make it) when it gets round to O.

*This event indirects through &220 and so by changing the address there, inserting a small routine at the new address and typing *FX14,5 (to enable this particular event) you have created a kind of alarm. The enclosed program does just that.*

10-30 *Sets the address for the routine to &ADE (top of the space reserved for function keys).*

40-80 *Saves registers, prints CHR$(7) a number of times, recovers registers and ends.*

90-150 *Sets the number to be written to the interval timer.*

160 *Sets registers for Osword with A=4, and pointer to &70.*

170 *Enables the event and sets interval timer.*

This program will produce a long beep after the set number of minutes and will work as long as all the function keys aren't programmed – keep to two or three to be safe.

To expand the message it will be necessary to rewrite the routine at &ADE, remembering to change the values at &200, &201 and P%.

Once you have run the program it is possible to run another one, but do not press Break as this resets the vector and timer.

The program has been tested with delays up to 10 minutes. – **Joe Faith (14), Bletchingdon, Oxfordshire.**

```
10 ?&220=222
20 ?&221=10
30 P%=2782
40 [OPT2
50 PHP
   :PHA
   :TXA
   :PHA
   :TYA
   :PHA
60 LDA #7
   :JSR &FFEE
   :LDA #7
   :JSR &FFEE
   :LDA #7
   :JSR &FFEE
   :LDA #7
   :JSR &FFEE
   :LDA #7
   :JSR &FFEE
   :LDA #7
   :JSR &FFEE
   :LDA #7
   :JSR &FFEE
70 PLP
   :PLA
   :TAY
   :PLA
   :TAX
   :PLA
   :RTS
80 ]
90 INPUT "DELAY IN MINUTES
   ",D%
100 IF D%>600 VDU 7
   :GOTO 90
110 D%=D%*6000
120 !&70=&FFFFFFFF-D%
150 ?&74=&FF
160 A%=4
   :X%=&70
   :Y%=0
170 *FX14,5
180 CALL &FFF1
```

Elegance a side effect

JUST for the record, I have never advocated recursion. Nor is elegance the most important characteristic of good programming in my scheme of priorities.

Frank Hughes is demolishing arguments I have never put forward.

My only original uses of recursion have been for fun or demonstration, and elegance is a side-effect of good programming as it often is of any kind of good design process.

I must repeat that readability is what counts most. Many good things flow from this – correctness, shorter development time, ease of updating or adapting, better personal skill development.

Again, for the record, I agree with Dr Freshwater that there is no real difference between THEN GOTO 50 and THEN 50 and I have never said there is.

They are equally undesirable and the well-documented causes of unreadability of programs. Why is it pompous and pedantic to say that?

Perhaps I'm not as clever as Messrs. Hughes and Freshwater. In the old unstructured days I often failed to understand my students' programs (so did they).

Now their programs are much longer and more ambitious, yet I find them easy to understand. – **Roy Atherton, Director, Bulmershe Computer Education Centre, Earley, Reading.**

Six of the best?

DAVID H. Wilde's letter in the March "Micromail" in reply to my own in December's would be a good endorsement for nominating me as editor of The Wally's Guide to Home Computing.

I feel he must be a schoolmaster, determined to give me six of the best for frivolity.

My letter was written in irritation at the smugness and preciousness that so many programmers evince, proudly drawing attention to the fact that "the program is fully

→

MICROMAIL

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structured, as there is not a single GOTO or GOSUB to be found".

I cannot see why the mere omission of line directions necessarily makes for better structured programs.

As a case in point, I recently copied out a Logo program written by Fintan Culwin in the January 1983 "Your Computer" and counted 36 GOTOs and 49 GOSUBs among the PROCs and functions.

Yet it was clear and structured, using all the facilities of the language to produce an efficient and well-running program.

Can you picture the editor of Your Computer saying: "Hey Fintan! For God's sake man, all those GOSUBs!".

Fintan goes away muttering, returns hours later with sore fingers and the thing completely procedured. "That's better, my boy!" beams the Ed, "and it still works just the same".

Hence I fancy the pragmatist's approach rather than the purist's. GOTOs and GOSUBs were not just thrown in for Wallies who don't know any better. – **David Bye, Saffron Walden, Essex.**

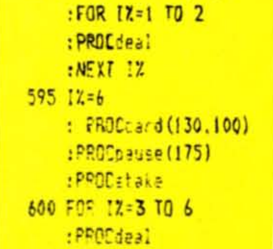
GOTO h . . .!

I AM sick and tired of reading about PROC and GOTO. – **A.N. Haslvem, Lewisham, London.**

Enhanced Blackjack

BLACKJACK, which was featured in the November issue of The Micro User, is an excellent and well thought out game that is written well, in spite of its cumbersome upper and lower case variable names. However I have one small criticism relating to the way in which bets are placed.

It is usual in Blackjack (or Pontoon even) to place your bet on the value of the first card dealt to each player, and not to bet blind, as in this game. I believe it enhances the game to carry out a simple modification in PROCmain to achieve this, as follows:



```
590 PROCline(" ",30,0)
    :FOR I%=1 TO 2
    :PROCdeal
    :NEXT I%
595 I%=6
    : PROCcard(130.100)
    :PROCpause(175)
    :PROCstake
600 FOR I%=3 TO 6
    :PROCdeal
    :NEXT I%
```

Line 590 now causes a faced card to be dealt to each player and the new line 595 causes a face-down card to be dealt to the bank. This card does not need a stored value at this stage, as this is purely for pictorial effect to complete the first round of the deal.

PROCstake then operates as normal, but the players can see what they are betting on.

Line 600 then causes the bank's first card to be revealed and the second card dealt to each player and the bank normally.

I have our version permanently amended in this manner.

One final note worth mentioning is that blue often does not show up very well as text or narrow lines on a TV set. Try cyan instead. It gives better relief to the black and red suit symbols.

There's a wrong note, 5 from the end, of the "Fiddler on the Roof" theme. Can anybody say what is better than pitch 141 (A sharp) for this melody? I have no ear for music, but this one stands out! – **Brian Spencer, Hertford.**

Laserbug query 1

COULD you please let me know if the User Group known as Laserbug have ceased trading?

As an independent publication with no advertising revenues from them you are an unbiased judge.

On December 20, Laserbug cashed my cheque for a year's subscription. Now five letters later, two of which were recorded, I have had no reply.

Is it possible for you to chase them up? I can get no direct communication because no telephone number is listed. – **M.A. Parker, Haverhill, Suffolk.**

Laserbug query 2

I READ with interest the letter from K.R. Derbyshire in the April Micro User. I agree with everything he had to say.

I also found Laserbug reluctant to answer any letters if they were of the complaint variety.

They advertise for new members every month in several magazines but they cannot supply their existing members with the monthly news magazines for which members have already paid for.

With regard to the certificate which Paul Barber refers to, I don't think you will be missing out on anything worth having. What good is a certificate from a company or user group if they no longer exist?

I am not pushing for BeeBug, but I have found them to be very good and very helpful in every way and I find their magazine very well laid out and I look forward to it every month eagerly (as I do yours).

I would like an article in your magazine on how to formulate a program for joysticks. I seem to

Watch out for stolen equipment

I AM sure I am not the only BBC computer user whose addictive hobby has been interrupted by burglary and theft, and it occurs to me that you could perform a useful service by publishing a list of stolen equipment, with serial numbers.

This could set honest dealers and users on their guard when offered second-hand equipment, and possibly lead to the conviction of thieves and others handling stolen property.

My experience is a warning to other computer users, as only micro related equipment was stolen. I have to ask myself whether I have talked about my Beeb, printer and Prestel adapter to any strangers who could have taken a fancy to it.

I do not wish to run the risk of my replacement equipment being stolen, so I ask you not to publish my name and address. A list of the items stolen from my home on March 7 is as follows:

BBC model B computer, 1.2 OS, serial number 105521; Shinwa CP80 printer, with cable (5002853), Ferguson TX colour television, grey cabinet, model 37140, 14in. (G104205), Sony TCS300 portable cassette recorder with rechargeable batteries (98274), Tandata TD1100 Prestel adapter (29135).

Keep up the good work in the magazine. For one who was contemplating disc drives, the March edition I found particularly useful. – **Name and address supplied.**

● Sorry to hear about the loss of your equipment. We're only too glad to publish the list of missing items and we'll endeavour to do the same for other readers.

If anyone out there recognises any of the items, let us know.

● ***Want to write to Micromail? The address is: Micromail, The Micro User, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.***

find it beyond me.

Thanks for an excellent magazine, it seems to cater for the thick like myself, as well as the pro. – **K. Lawler, Dewsbury, Yorkshire.**

● We have already covered the addition of joysticks to programs in our Body Building course in the May, 1983, *Micro User*.

A utility to adapt keyboard programs was given in the October issue. And a simple games paddle was described in our very first issue in March, 1983.

However we have plans for a far more comprehensive article on the subject in the near future.

Laserbug query 3

K.R. Derbyshire's experience with Laserbug comes as no surprise to me.

On August 19, 1983, I posted a cheque to Laserbug together with an order for a 1.2 OS ROM. This cheque was paid by my bank on September 6.

After a wait of some six weeks there was no sign of the ROM. During the next six weeks a number of letters, including one from the Trading Standards Office, Eastbourne, were all ignored.

One of these letters might have gone astray, but not all, and certainly not the last, which was Recorded Delivery.

As seven months has elapsed it is clear that Laserbug intend to keep my money. Subsequently I obtained the ROM elsewhere with no trouble at all.

I would cheerfully have obtained a county court summons to reclaim the money. However I was advised that it was necessary to ascertain the name of the owner of the concern.

Since the Register of Business names has now been abolished the only way to obtain this information was by a request to Laserbug.

My advice to anyone dealing with Laserbug is "caveat emptor!" – **T.W. Clements, Hailsham, Sussex.**

Prime numbers check-up

THE program "Finding Prime Numbers" was written in response to a request from some of my secondary modern arithmetic pupils to have a readily available check on which numbers are prime.

Finding the first few is relatively simple to do manually, but as the upper limit increases the exercise becomes tedious and time consuming.

The program, therefore, also calculates the time taken to find the numbers.

As written, the program will print out the results in eight columns up to the desired limit, the display on the screen being in four columns.

If the program is to be run without a printer line 120 must be deleted – VDU2 being the command that will "activate" the printer, in my case an Epson MX-80.

It would also be prudent to delete line 290, which switches off the printer.

The variables used are:

PN — *The number being tested for "primeness".*

Y — *A count, used to control the tabulation on printout.*

FLAG — *This is set to 0 until PN is found to be non-prime when it is then set to –1.*

– **C.H. Hayter, Gillingham, Kent.**

```
10 REM **** FINDING PRIME
    NUMBERS ****
20 REM
30 REM ******** (C) C.H.Ha
   yter *******
40 REM
50 REM *************
    1983 *************
60 REM
70 REM This program will
    list the primes on
    a printer.
80 REM If you are not
    linked with a printer
    it will be necessary
    to delete lines 120
    and 290
90 MODE 7
100 INPUT TAB(5,10)"UP
    TO WHAT LIMIT ? "NUM
```

```
110 CLS
130 TIME =0
140 PRINT "LIST OF PRIME
     NUMBERS UP TO ";NUM
150 PRINT "****************
    ***************"
160 PRINT
170 PN=0
    :Y=0
180 REPEAT
190 PN=PN+1
    :FLAG=0
200 FOR X=2 TO INT (PN/2+.5)
210 IF PN/X=INT (PN/X)

    THEN FLAG=-1
220 NEXT X
230 IF PN=1 FLAG=-1
240 IF PN=2 FLAG=0
250 IF FLAG=0 PRINT
    TAB(Y*10);PN;
    :Y=(Y+1) MOD 8
260 UNTIL PN=NUM
270 PRINT '''"Time taken
     ";TIME /100;" seconds.
     "
280 PRINT ''''
```

No problem

AS a fairly new BBC B owner am I alone in viewing with slight alarm the appearance of the Electron?

I am worried that software houses will now tailor existing programs and write new programs predominately for the Electron's reduced capabilities with the tag line that they also work on the BBC.

Could we BBC users end up with inferior programs, which for sound commercial reasons will be aimed at the combined Electron/BBC market? I hope not.

I wonder if any program house could allay my fears. – **M.J. Morris, Cheltenham.**

● Quite frankly, no programming house would be so stupid. They're in it for the money, and BBC Micro owners are a discriminating lot.

You identified

I FELT I had to write to you, as I have one or two unanswered questions, as well as the odd comment.

Firstly, though, may I add my name to those thousands in praising the high quality of the articles and the way in which they are presented – not assuming we know it all.

Now to the questions:

While playing around with my machine operating calls, I came across the OSFILE routine which deals with files, accessing an 78 byte control block stored in memory, the last four bytes of which give the file attributes.

The LSB of these four, states the User Guide, can be assigned a value of 0-7, which include "not readable by you," "not executable by others," etc.

Could you please tell me how you tell the computer who "you" and "others" are for future use of the file?

Also, has anyone found a use for the Tab key, except for dropping smart bombs? – **Stuart Reynolds, Thorpe Bay, Essex.**

● "You" means the user reading the attributes and "others" means other users of, say, the Econet filing system.

The Tab key was included in

→

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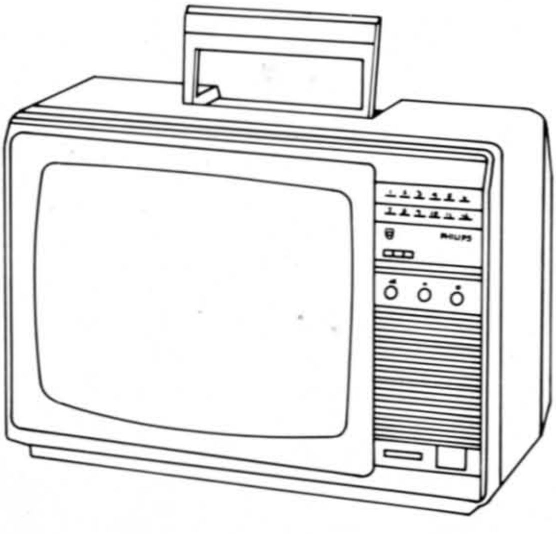

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MICROMAIL

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the BBC Micro for use with word processors. As you know, its Ascii value may be changed by using the command *FX219 (OSBYTE&DB).

Auto run to music

AFTER typing in the Christmas Card program listed in The Micro User for December 1983, I found that by adding the lines:

```
935 TT%=TIME
1015 IF TIME >TT%+9100
     THEN RUN
```

the program auto ran itself after the candles had been on the tree while Silent Night played. – **Andrew Baker, Wellfield Junior School, Sale, Cheshire.**

Control code catch

*CONTRARY to your comment on Michael Swatton's letter (Micromail, February 1984), control codes are not suppressed when sending output to "printer only" under *FX3,10.*

*The catch is that under *FX3,10, code 1, normally used in print statements to prevent control codes reaching the screen and removed from output by the computer, is sent along with everything else to the printer.*

For example, a two byte control sequence such as ESC+X (which turns on underlining in my NEC printer) is normally coded as VDU 1,27,1,88 and received by the printer as 27,88.

*Under *FX3,10 the printer receives the full sequence 1,27,1,88. Note that the byte immediately following code 27 is now 1, not 88.*

The sequence 1,27,1 means nothing to the printer, so it ignores it, treats 88 as a printing character and prints "X".

*My solution has been to omit the VDUs from print statements that are to be executed under *FX3,10.*

*Alternatively, if *FX6 is not required to suppress linefeeds or some other character, *FX6,1 will ensure that code 1 does not reach the printer, even under *FX3,10.* – **Colin W. Robertson, Maidenhead, Berks.**

Remember the Tyros

AS a regular reader from your very first edition, may I make a plea for people like myself who have no proper training in computers.

Please keep a fair proportion of your magazine for those who still think that "&" means "and".

The articles and letters I find most interesting are those which are quite simple but can be of considerable help when attempting to write a program.

The two listings I enclose are examples of what I mean. Perhaps you will see fit to publish them. I find them very useful for headings, etc. – **P.A. Back, Bournemouth.**

```
10 REM "CENTRE"
20 MODE 7
30 PROCCENTRE("CENTRED"
   ,8)
40 PROCCENTRE("HEADINGS
    WITH",12)
50 PROCCENTRE("COLOUR"
   ,16)
60 END
70 DEF PROCCENTRE(A$
   ,Y)
80 PRINT TAB(20-LEN (A$)/2
```

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MICROMAIL

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```
   -2,Y)CHR$ 141;CHR$ 129;
   A$
 90 PRINT TAB(20-LEN (A$)/2
   -2,Y+1)CHR$ 141;
   CHR$ 131;A$
100 ENDPROC
110 COLOUR C%
120 PRINT TAB(10-LEN (A$)/2
   ,Y)A$
130 ENDPROC
```

```
 10 REM "CENTRE"
 20 MODE 2
 30 C%=1
 40 PROCCENTRE("CENTRED"
   ,8)
 50 C%=2
 60 PROCCENTRE("HEADINGS
    WITH",12)
 70 C%=3
 80 PROCCENTRE("COLOUR"
   ,16)
 90 END
```

```
100 DEF PROCCENTRE(A$
   ,Y)
110 COLOUR C%
120 PRINT TAB(10-LEN (A$)/2
   ,Y)A$
130 ENDPROC
```

Over the barrel

I REFER to your program listing of "Barrel Battle" in the January 1984 Micro User.

The problem I have is on lines 82, 87 and 89.

These require more than six lines of space when typing them, which of course the BBC B will not accept.

What can be done about this? I always read your magazine and would appreciate your help. – **T.W. Hayter, Orpington, Kent.**

● Sorry you're having problems. The answer is quite straight forward, though.

The insert on the first page of the listing tells you that it is a special formatter and not to press Return until you get onto the next line.

So, where the listing reads:

```
31 X%=X%+H% (spaces)
   :Y%=Y%+V% (spaces)
   :COLOUR Q%
   :C%=C%+1
   :IF C%=229
   etc
```

you type:

```
31 X%=X%+H%:Y%=Y%+V%:COLOUR
   Q%:C%=C%+1:IF C%=229
```

and so on until the end of the line.

Tutorial

THANK you for your series of articles in The Micro User under the heading "Tutorial" – that is, up to part six.

But what happened in the September 1983 issue, and since?

I subscribe to your magazine exclusively for this series because of its superiority over the BBC User Guide which, and I quote, "is NOT a step by step course in basic programming". – **C.T. Hodgson, Malvern, Worcs.**

● Thank you for your kind comments. The article did not appear in the September issue, but it has been in every month since.

In October it was called "Loops" in the contents page, and from then on it has been titled the more sensible "Beginners".

★ ★ ★

WILL you please tell me where I can obtain software programs for the BBC Model B on farm planning, budgeting and accounting? – **D.P. Gibbon, Cringleford, Norwich.**

● Sorry, we've never heard of any programs aimed at farming.

And finally, with tongue firmly in cheek . . .

Hoping for a Bad Dim

Dear Trev,

Sorry I haven't written for so long but I've been trying to get in the Guinness Book of Records for teeth gnashing (with optional hair tearing).

The reason, of course, is Andrea or, rather, Andrea's friend Deirdre.

Remember when I had to have my Beeb in the front room because the bunker was being redecorated? Well Deidre called round and saw me using Bug.

"Oh", she cried, "isn't it nice? George has got a Sloth, but this is much better. Does it do colour?"

Well you know me, little ROM and rather a lot of output interfaces. Of course I had to tell her all about the graphics abilities of the Beeb. I waxed on like an Acorn spokesman, telling her everything but the delivery date.

"Pixels!" she cried, "How sweet!" A glazed look came to her eyes and I realised that she was hooked, another embryo micro addict.

"You know, a program is just like a knitting pattern, only lots more fun", she enthused.

Andrea arrived home shortly afterwards and saw what was going on. "So he's been showing you his thing, has he? Don't let him lure you upstairs to let you look at his listings".

Deidre (bless her) ignored this and told A. how grateful she was that I'd showed her how to use Bug. Apparently George wouldn't let her use his Sloth even though she'd often asked.

"Don't worry", A. said, spontaneous generosity making her voice swell, "you can come round and use Bob's micro anytime you want".

"Anytime you want" being the operative words. Nowadays I can't get on my micro for Deidre popping round for "five minutes on the Beeb" and staying until the early hours monopolising my micro.

I just sit around thinking nostalgically about the good old days when all I had to worry about was whether or not I'd remembered the cassette bugs fix.

As it is I pine for a Syntax Error message or a Bad Dim. I'm getting both withdrawal symptoms and funny looks from George.

It's got so bad that I dream about it at night. Somehow or other I'm a resistance fighter in an occupied country during the war. I'm wandering the streets trying to find a safe house where I can set up my illicit Beeb.

As I'm typing away in comes Deidre (looking frighteningly fetching in her black leather uniform) and grabs my micro.

Invariably I wake up screaming, "Not again, Deidre", which gets me funny looks from Andrea as well.

Yesterday I found myself playing with my pocket calculator for comfort. I think I'm cracking up. Any advice? ***Bob***

P.S. All is well, Deidre's bought her own micro. Apparently she got the money by selling a program she'd written. You draw a picture of a pullover on the screen and the Beeb prints out a knitting pattern. And as a reward for "lending" her my micro, she's knitted me a special pully with every error message on it. People can be so thoughtful!

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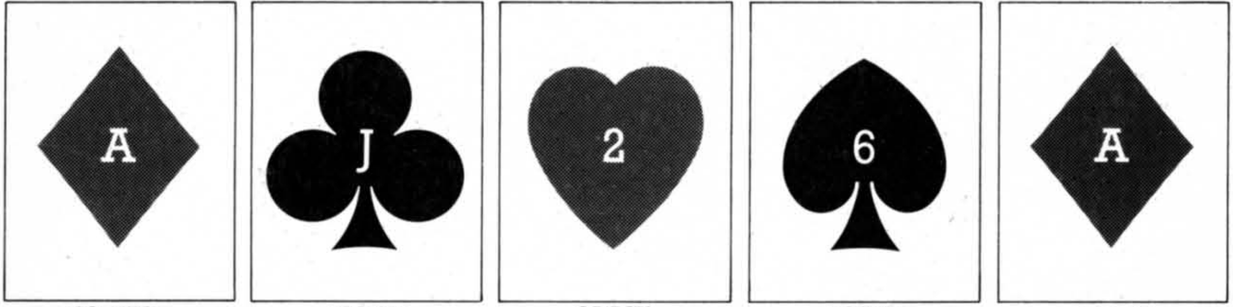

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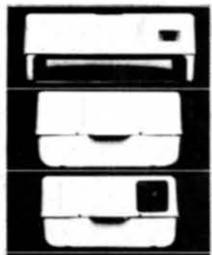

Front

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Disk drive space, (in consol) 15.5cm x 10cm x 40cm, solid base for TV monitor and computer pocket base plate.

Left

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Special sections for switches and socket.

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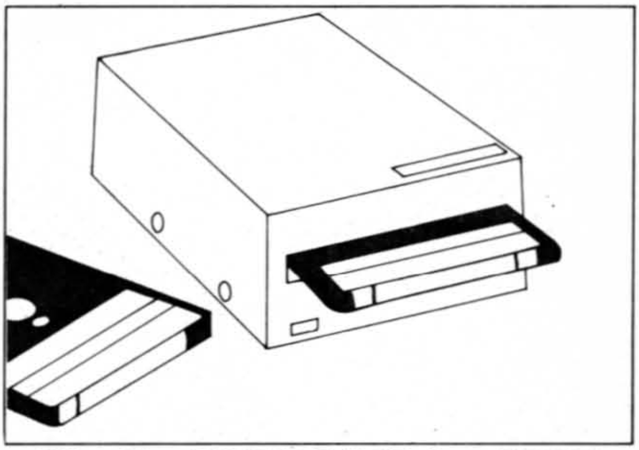

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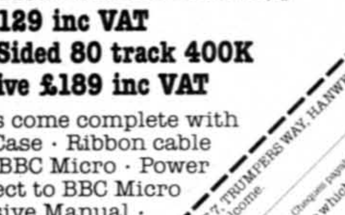

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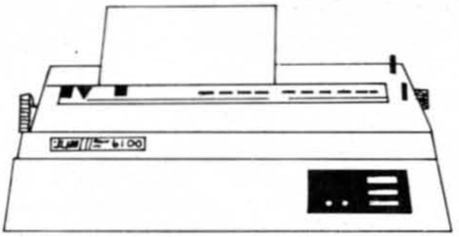

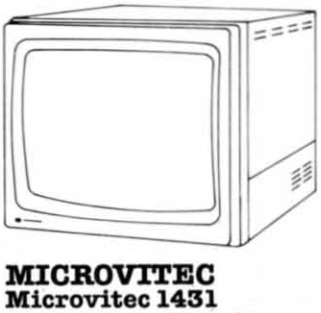

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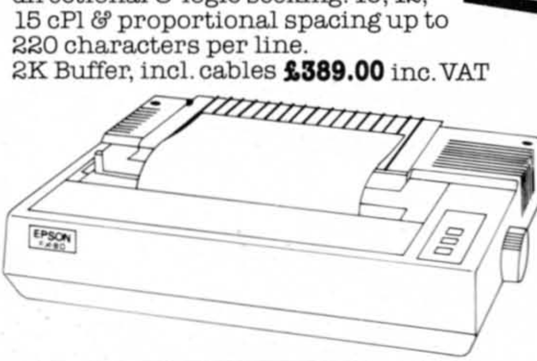

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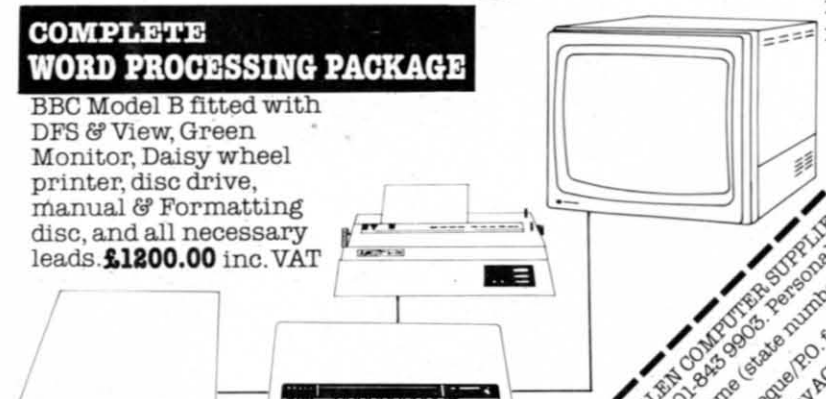

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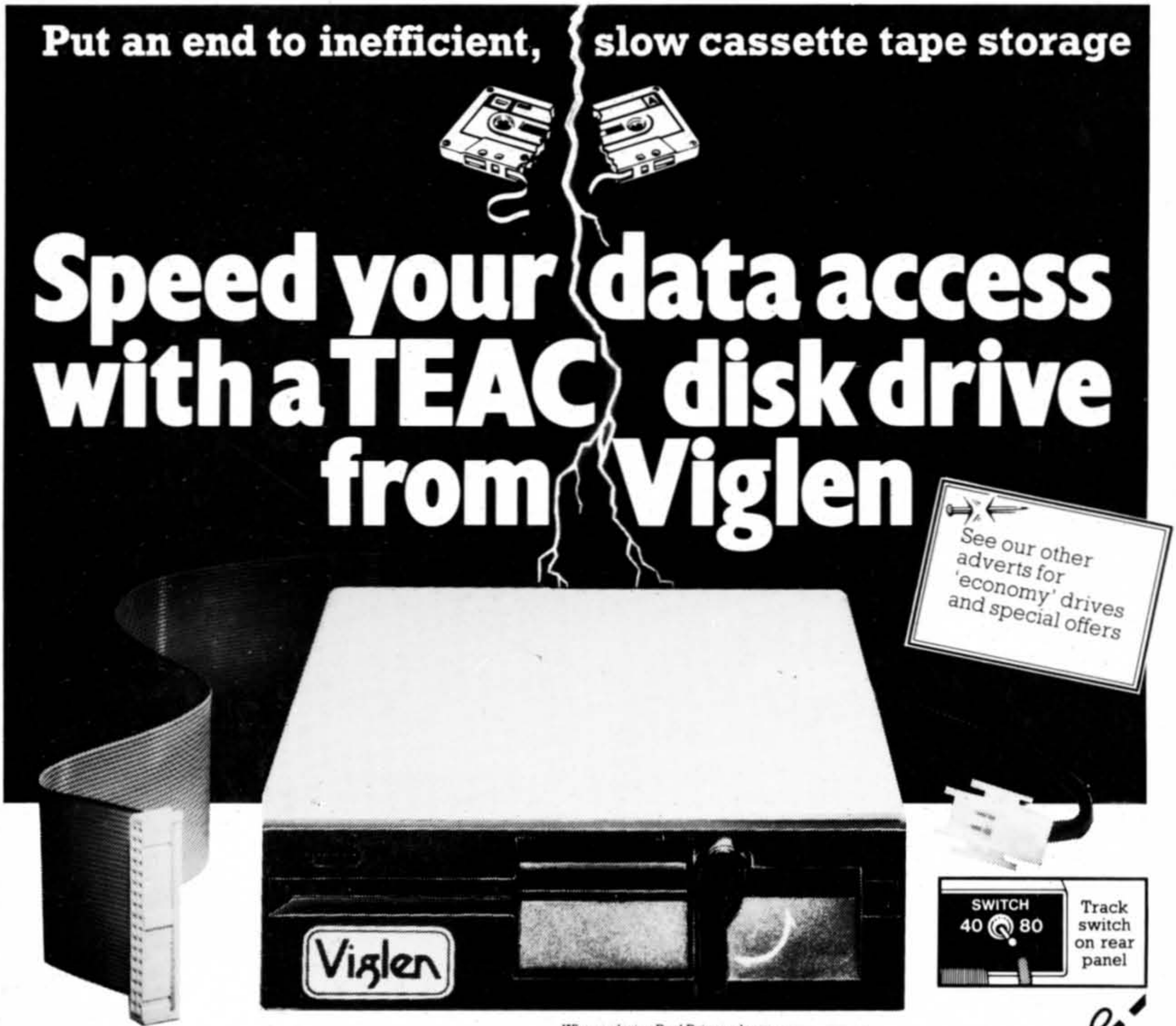
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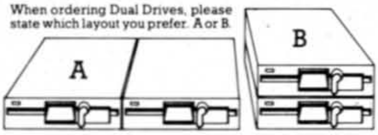

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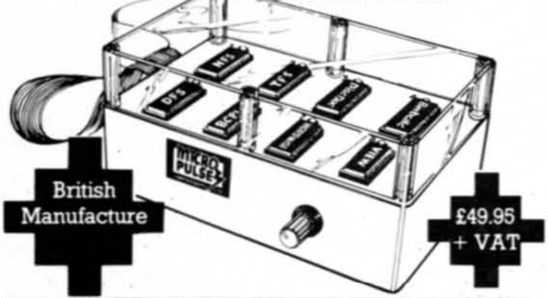
For the BBC Computer and the Acorn Electron



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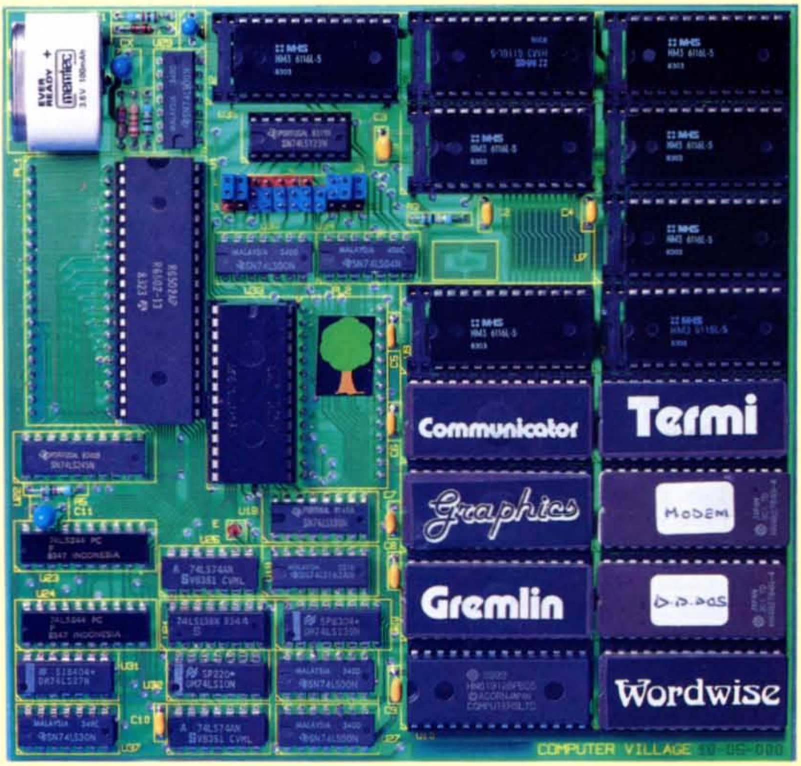

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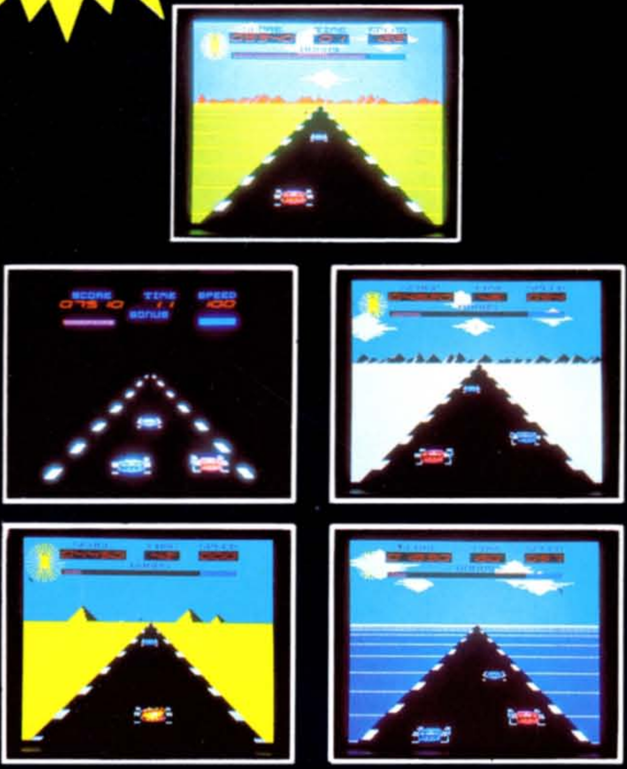

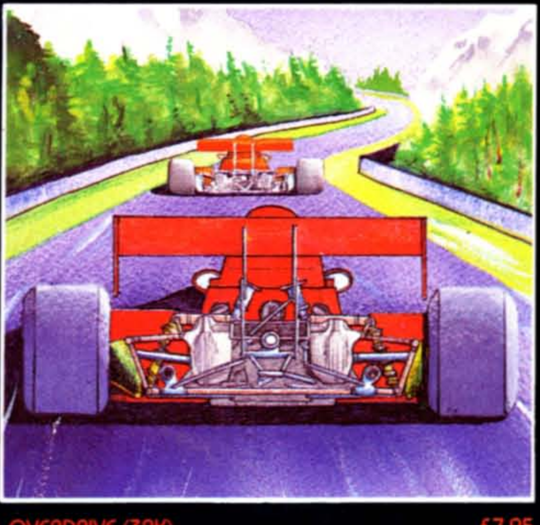

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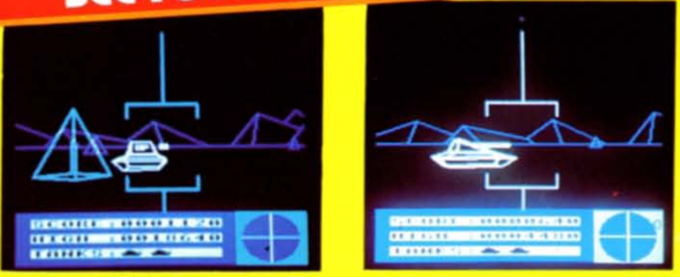

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